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Full details on Page 9

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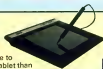
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# 800 XL WINS TITLE

ATARI's 800XL has carried off the prestigious Home Microcomputer of 1985 title in this year's British Microcomputing Awards.

It beat off the challenge from the Amstrad CPC464 and Sinclair's Spectrum+ in the final to get the nod from the judges.

Rob Harding, Atari UK's sales and marketing boss, is seen right receiving the trophy from Matt Nicholson, editor of What Micro?, the magazine which sponsors the award.

The presentation took place at a Hollywood style award ceremony hosted by Sir Alastair Burnet in the Park Lane Hotel, London.

Recognised as the "Oscars" of the computer industry, the event this year attracted more than 1,000 nominations.

Organised by Personal Computer World, the Sunday Times and Thames Television, the awards "seek to define technological excellence and value for money for the consumer".

While pointing out that What Micro? sponsored the award but did not judge it, Matt Nicholson did concede to Atari User the reason his magazine nominated the 800XL for the honour in the first place.

"The reason we selected the Atari was mainly because of its £130 price tag", he said. "It was just very good value."

"We felt the 800XL is a good computer, with a decent amount of memory, very good graphics and a good range of software that is no longer so expensive."

That's why we even rate it above a Spectrum".

But the final word was left to an obviously delighted Rob Harding.

"We believe the machine is an unbeatable combination of performance and value for money - and obviously the award judges fully support our view."



Smile of success: Rob Harding and trophy, with Matt Nicholson

## Atari bids to topple BBC

**ATARI is poised to launch an all-out bid to capture a major share of the education market.**

Effective immediately, it is offering all educational establishments a 22 per cent discount on 8 bit hardware packs and software, and 25 per cent on peripherals.

Speakeading the drive to knock the BBC Micro off its perch in Britain's schools and colleges are two bundled offers containing the 800XL - winner of the Home Microcomputer Award for 1985.

Atari Logo System I contains the 64k 800XL, Atari 1010 program data recorder, LCSI Atari Logo cartridge, Introduction to Programming through Turtle Graphics, Atari Logo reference manual, Atari Logo

quick reference guide, Atari Basic (built in), Invitation to Programming 1, tutorial software, sound and graphics demonstration software, Pole Position racing simulator, plus all leads and power transformers.

The special educational price is £128.85 compared to the recommended regular retail price of £165.20.

Atari Logo System 2 contains the 800XL, 1050 disc drive, LCSI Atari Logo cartridge, Introduction to Programming through Turtle Graphics, Atari Logo reference manual, Atari Logo quick reference guide, built in Atari Basic, disc operating system software, Home Filing Manager database software, sound and graphics demonstration disc, The Pay Off

adventure game, and all leads and power transformers.

Special education price is £210.25 compared to RRP of £269.55.

Atari is also offering educationalists the 130XE for £119.30, the 800XL for £88.17, 1050 disc drive plus DOS software for £130.43, 1010 program recorder for £22.82, 1029 dot matrix printer for £130.43, 1027 letter quality printer for £163.04, Atari graphics touch tablet plus software for £32.80, and Atari LCSI Logo and manual for £40.69.

Atari's Jon Dean said: "We are in the process of finalising our distribution outlets that will serve users of Atari equipment in education. Orders will be processed directly from Atari UK."



Island Records' James Bradley, Tony Pope, manager of Frankie Goes to Hollywood, and Ocean Software director David Ward preview the new game.

## IT'S BARGAIN TIME ... with a cheaper model and free software

ATARI says it is developing a cheaper version of the ST – the 260ST. And it could be available here in the autumn.

The operating system with 256k of memory will contain an impressive amount of software on board on ROM, a spokesman told *Atari User*.

No price has yet been set for the machine, which will be released in the UK at the same time that it comes out in the US.

There is a possibility that it could be on display at the PCW Show in September, but this has not been confirmed.

## Downloading

FOR the first time ever free telesoftware for downloading to Atari computers has been introduced by Viewfax 258 on Prestel.

Atari owners with Viewterm can copy the software using the built-in downloader in the Miracle Technology package.

The program demonstrates some of the capabilities of

Atari's versatile GTIA chip – the television interface chip that converts digital information received from the Antic chip for screen display.

The software is similar to demonstration programs seen in computer shops.

Written by Jerry White, the program uses Basic and machine code and runs on the Atari 800 series and 1300XE.

## Wait for it

THE fully-integrated spreadsheet/database/word processor package Infinity expected from US developer Matrix Software will not now appear, says Atari.

The package was planned as a much cheaper version of the top-selling 1-2-3 for the ST range.

However, Atari is promising that a "very similar" product will soon be available – "a practically identical package with the same facilities at a similar price, under £100", according to a spokesman.

## A treat for pop fans

YOUNG Atari users who have difficulty in making up their minds on whether to spend their pocket money on computer games or pop music have a treat in store.

Ocean Software's latest game program, *Frankie Goes to Hollywood*, comes with a free audio-cassette containing an unreleased, live recording of *Relax*.

But – before all the kids go rushing off to the shops – the Atari version will not be available until late summer.

The game has been produced in a joint publishing venture between the group, its recording company Island Records, creative producers ZTT and Ocean.

Says Ocean's David Ward: "Datatune is a new idea – players load the game from the program cassette, and then insert the audio-cassette."

"A voice over will describe how to play the game on side one, and on the flip side players can hear some inspirational

music in the form of one of the band's hit recordings."

*Frankie Goes to Hollywood* is named selling price of £9.95 for the Atari version, which is the usual price for Ocean's longer-running arcade adventure game programs. It will contain more than 124 screens.

The game's scenario is written around the Frankie philosophy, and the possibility of escape from a mundane existence into the delights of the Pleasure Dome.

To gain entrance, the player must grow from a shadowy Frankie figure into a complete 100 per cent person by earning pleasure units.

These are achieved by travelling from a prosaic everyday house, through ordinary living-rooms and kitchens into complex maze situations, and by solving complex puzzles which require both strategy and skill.



# Games go on, says Atari

ATARI has denied that it is pulling back from games software production, despite drastically slimming down its programming staff and licensing an increasing number of its titles to independent producers.

The latest game to follow this route is *The Pay Off*, which was originally produced to promote Atari disc drives. Now its authors, Bignose Software, have gained the rights to produce a cassette version.

But this doesn't mean Atari

has lost interest in the games market.

Far from it, says sales boss Rob Harding - "We see a big future for our 8-bit machines like the 800XL and 130XE."

"We are planning further improvements and developments for this range and will be bringing in our own games and small business software."

"In addition we will be encouraging independent software houses to design programs for these machines".

## ST programs lining up

AS many as 300 new programs for the Atari ST range could be unveiled at the PCW Show next month.

Development systems have already been delivered to more than 100 UK software houses and most of them are working on more than one program, says Alan.

This means there are almost certain to be at least 200 and possibly as many as 300 ST software items ready for sale or

in prototype form at the big autumn show.

Atari expects one-third to be serious business applications, one-third productivity including utilities, and one-third recreational including graphics, design, music and games.

"We are making sure the ST software comes not only in a wide range but covers all aspects of a variety of applications", Atari's Rob Harding said.

## Reason why...

AMERICAN program writers' interest in Atari computers is so high that 400 software developers attended Jack Tramiel's recent address to the Software Publishers Association.

The SPA's executive director, Ken Wasch, described Atari's new machines as "the event of the Consumer Electronics Show in Las Vegas".

Tramiel described his activities since he left Commodore and the evolution of his concepts of a new generation of affordable technology.

He let the audience in on the

real reason for his going back into the computer business.

"I was in Japan", he said, "and everyone I was talking to was smiling."

"They were thinking that now Jack's out of computers it's time to go into the US".

Wasch said: "Jack Tramiel's enthusiasm was contagious. A broad range of software developers want the machines to succeed."

"If Atari fulfils Jack's promises I think these software publishers would be crazy not to take the bait".

## ATARI USER

## READER OFFER

# DOS 2.5 upgrade - and it's free!

*"If you've got a disc drive and currently using DOS 3, then you should think very seriously about switching to 2.5 as soon as you can get your hands on a copy".*

THAT'S what our technical editor André Willey wrote in last month's *Atari User*, when he gave an enthusiastic review of Atari's new operating system.

DOS 2.5 offers many advantages over DOS 3, which was issued with the Atari 1050 enhanced density disc drives - particularly ease and convenience of use and compatibility with Atari DOS 2.0. It also includes several utilities, including a Diskfix, a DOS 3 to 2.5 file converter and a Ramdisk for use with the 130XE.

The DOS 2.5 disc also features a "Mini Manual", explaining in detail how to use the new DOS. This can be read or printed using the Atariwriter word processor.

Alternatively, for people without Atariwriter, an additional program has been included which displays the "Mini Manual" from Basic, either on the screen or a suitable printer.

Atari User is happy to be able to offer the new DOS 2.5 to readers in one of three ways:

- Send us a blank disc, together with a return postage stamp and the coupon below giving your name and address. Make sure that the disc is adequately packed. There is no charge for this service but it is limited to one disc per coupon.
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## Spielberg epic goes on disc

AMERICAN publisher Datasoft's latest releases include five titles for the Atari XL to be distributed here by US Gold.

Foremost is an action/strategy game based on Steven Spielberg's latest blockbuster film 'The Goonies' featuring eight maze-type screens of increasing difficulty with pirate's treasure as the goal.

It will cost £9.95 on cassette and £14.95 for the disc version. Another all-action game is based on the legendary character Zorro whose adventures take him through 15 screens. Prices £9.95 for cassette and £14.95 for disc.

Datasoft has also acquired the licences for Pole Position II and Elevator Action, two of the most popular arcade games in recent years. Prices £9.95 for cassette and £14.95 for disc.

Alternate Reality is a seven part series of fantasy role-playing games, and The City is the only one that must be bought in order to play the others - The Dungeon, The Arena, The Palace, The Wilderness Rhapsody and Destiny.

Game play is controlled by a combination of keyboard and joystick and it will be available on disc only for £19.95.

\*\*\*

SOFTWARE for the Atari ST series will include utilities from Rising Star Industries according to reports from California.

The firm is understood to have signed an agreement with Atari for its Valdes range of software to be distributed with the ST.

First releases are expected to be Valdraw and Valpaint.

\*\*\*

ATARI is to raise an additional \$150 million by the summer of 1986 in order to finance its corporate expansion plan.

The corporation also intends to go public some time this summer.

# Electronic censor may clean up the bulletin boards

**NAUGHTY words of a type that would make even a sergeant major blush are increasingly confronting Atari users who log onto bulletin boards.**

All over the UK, systems operators are being forced to devote more and more of their time to erasing electronic graffiti.

The obscenity problem has been one that to date has baffled the industry. However according to the latest issue of *TeleLink* - a sister publication of *Atari User* - help may be at hand.

It takes a look at a new Naughty Words Editor which is currently being evaluated

by MicroLink, the recently-launched nationwide service for micro users.

The man in charge of the project is 39-year-old Tim Clarkson. He explained to *TeleLink* just how the Naughty Words Editor should work.

"You initially create a text file or glossary of naughty words or phrases", he is quoted, "so when these turn up in any message the whole of the text is pulled out and put in an obnoxious file."

"Later the messages are checked over by the sysop to see whether it's safe for them to be released".

That's the theory behind it, but in practice - according to

*TeleLink* - it has been presenting more than a few problems.

First of all the systems operator needs to have the vocabulary of a drunken sailor.

The second, and possibly the major pitfall is that certain obscenities can crop up quite harmlessly within words.

One of the worries that faces Tim Clarkson is what to do with the species most cherished by birdwatchers, the tit.

"Used in the ornithological context, this word could in no way give offence", he says. "However once it becomes anatomical then eyebrows would understandably be raised."

"So you decide to err on the side of caution and classify 'tit' as a word that might possibly offend."

"What happens then however is that all messages containing with word 'tit' suddenly find their way into the obnoxious file".

In order to counteract this, the MicroLink arbiter of good taste has created a text file of phrases - and not individual words.

"This removes part of the problem", says Tim. "We can rule that tit is left in as long as it has 'blue' or 'crested' in front of it but not 'big'."

## It's victory all round..

A RECENT US court battle between Atari and Commodore over alleged theft of trade secrets has ended with both sides claiming victory.

Four engineers who had followed Jack Tramiel from Commodore to Atari were

acquitted of charges that they took company secrets with them.

The judge said Commodore had failed to prove that the men took any specific parts of the new 28000 disc drive with them, but ordered the engineers to return to Commodore "certain papers which happened to be in their pockets when they left".

The defendants' lawyer said they were "extremely pleased". The judge had "recognised that these four fellows did not steal any computer secrets and Commodore could not prove they did. This was a complete victory".

Commodore disagreed. Vice-president Joseph Benedetto said: "The judge clearly ruled that they wrongfully appropriated our property. It was a complete victory for Commodore".

## 32 bit micro on way

ATARI has confirmed it is working on a 32 bit CAD-CAM computer for release later this year - a VAX-type, mini-powered micro whose selling price has yet to be set.

Reports originating in the US said Atari is aiming to put mini power into a micro selling "at around the \$5,000 mark, at which it will go like hot cakes".



## SOFTWARE SPECIALIST

# Now let's get these variables down to work

WE saw last month how to label strings with variables. This meant that if we were using a string several times in a program we could use a variable instead of it.

For example:

```
A$="AUSTRALIA"
```

means that, from now on, instead of using "AUSTRALIA" in full in our programs, we can use A\$.

```
PRINT A$
```

will print out AUSTRALIA for you. Of course we had to make room for the string by telling the Atari its maximum size with a DIM statement.

The labels we used last month were all single letters of the alphabet followed by \$. The dollar sign tells the computer that it is a string we are labelling — such a variable is called a string variable.

It is called a variable because the "contents" of a variable (in technical terms, its value) can vary throughout

*Expand your knowledge of programming with Part IV of MIKE BIBBY's guide through the micro jungle*

a program. Program I should illustrate the point.

As you will see when you RUN it, the value of A\$ varies as we reassign it during the program. A\$ always takes the last value assigned to it.

You may wonder why on earth you would want to use the same variable for different things, rather than label everything separately. As we shall see, it can be extremely useful.

So far we have restricted our string variables to single letters of the alphabet followed by the \$ sign, such as A\$, B\$ and C\$.

However there is no need for such a limit — provided we follow them with \$. String variables can be made up of several letters, even words. They must, however, be capitals.

Program II illustrates the point. It is

our most sophisticated program to date, and is well worth having a close look at.

Incidentally, remember to enter NEW between programs.

Perhaps the first thing to remark upon is that our string variables, instead of being single letters, have grown into actual words. They've still got the \$ at the end, though, to show

```
10 REM PROGRAM II
20 DIM NAMES(20),FACES(20),THREADS(20)
30 PRINT CHR$(125)
40 NAMES="W. Smith"
50 FACES="You owe me money."
60 THREADS="Pay up or else."
70 PRINT
80 PRINT "Dear ";NAMES
90 PRINT FACES;THREADS
100 PRINT "cordially yours,"
110 PRINT "Mike"
```

Program II

that they're string variables, or labels.

Also, notice that while our labels are in capitals, the strings themselves, inside the quotes, are a mixture of lower and upper case. You'll need some deft manipulation of the Caps key as you type it in.

As you'll probably remember, the PRINT CHR\$(125) of line 30 clears the screen. It is good programming practice to use words for variables, since we can make the label describe

```
10 REM PROGRAM I
20 DIM A$(15)
30 A$="AUSTRALIA"
40 PRINT A$
50 A$="AMERICA"
60 PRINT A$
70 A$="AFRICA"
80 PRINT A$
```

Program I

what it is labelling. Programs make more sense this way.

Thus we use **NAMES** to label "Mr. Smith", **FACTS** to label "You owe me money", and **THREATS** for "Pay up or else".

This may seem long-winded, but it really does help to make your programs more readable, and hence easier to decipher. For example:

```
80 PRINT "Dear "NAMES
```

really tells you what the line is doing, far more than:

```
80 PRINT "Dear "AS
```

Similarly:

```
PRINT THREATS
```

is more meaningful than

```
PRINT B$
```

The moral is, use words for variables (labels) as much as possible.

Actually, you can use capital letters and numbers intermixed for variable names. For example:

```
NAMES$
RD2$
CSPO$
```

are all valid string variables.

However they must start with a letter – not a digit – and only capital letters are allowed. This means that:

```
1DAY$
2MORROWS
```

aren't valid.

Also, spaces aren't allowed, so:

```
FIRST NAMES
```

is illegal.

Variables shouldn't start with Basic keywords, as they confuse the Atari, so:

```
PRINTERS
```

is definitely out.

Try entering a program line such as:

```
10 PRINTERS$ = "EPSON"
```

Then LIST it – can you explain what happened? Steer clear of keywords in variable names.

While we're at it, try entering:

```
10 WRITER$ = EPSON
```

Spot the deliberate mistake? Well, the Atari does and rejects the line – EPSON should have been in quotes. If

you now enter LIST, you'll see the Atari has actually included line 10 as a program line – with ERROR in front of it.

This habit of the Atari can be rather irritating, but don't forget, you can get rid of a line by simply typing its number and pressing RETURN.

Although it's not likely to affect you at this stage, the Atari limits you to 128 variable names. The good news is that they can each be up to 120 characters long.

One advantage of using variables instead of directly using strings is that we can easily alter the output of the program.

In the case of Program II, if we want another victim to be the recipient of our letter, just change line 40. For example:

```
40 NAME$="Mr. Jones"
```

From then on all uses of **NAMES** in the program will refer to Mr. Jones.

In this short program it doesn't make a great deal of difference, but in larger ones, if you had used the string "Mr. Smith" every time, instead of **NAMES**, you would be in for a lot of retyping.

So far we have talked about string variables. However there is another kind of variable called a numeric variable.

Numeric variables are labels just as much as string variables are, only they label numbers in such a fashion that we can do sums with them. Try running Program III.

Line 30 uses the numeric variable **A** to label the number 10. Notice that for a numeric variable we can simply use a letter of the alphabet without following it with the \$ sign necessary for a string.

Also since it isn't a string, the value we are giving the variable doesn't have to be in quotes. Hence line 30 is simply:

```
30 A=10
```

Line 40 prints out, not **A**, of course, but the value that **A** labels, which is 10.

```
10 REM PROGRAM III
20 PRINT COS(C123)
30 B=10
40 PRINT B
50 PRINT 100
```

Program IV

The most interesting part is line 50. Here we multiply the number that **A** labels by two, so that the line prints out 20.

That's the useful thing about numeric variables – you can do sums with them!

Try running Program III with the following versions of line 50:

```
50 PRINT A+B
50 PRINT A/4
50 PRINT A*A
```

If you've been following what I've said so far you could be forgiven for thinking that string variables are for

```
10 REM PROGRAM IV
20 B1N 05(12)
30 PRINT COS(C123)
40 B2="10"
50 PRINT B2
```

Program IV

labelling words, and numeric variables for numbers.

Life is never that simple. You can, and often do, use string variables for labelling numbers – the point is that you can't do sums with them. Try entering Program IV, which is based on Program III, using the string **A\$** instead of the numeric **A**.

Once you've entered it, try adding the following line:

```
50 PRINT 2 * A$
```

As you'll soon find out, the Atari rejects line 50 out of hand. This is because you are attempting to do a sum with the wrong type of variable – string instead of numeric.

As with string variables, we do not have to (and should not) restrict ourselves to single-letter labels for numeric variables.

We can use words in a manner strictly analogous to string variables, save that we omit the final \$ sign. And, of course, we don't put what we are labelling in quotes, since it isn't a string.

Have a look at Program V. This is meant to be a cheery greeting for

```
10 REM PROGRAM V
20 PRINT COS(C123)
30 B1N 05(12)
40 B2="10"
50 PRINT "GOOD TO SEE YOU, "NAMES
```

Program V

someone when they RUN the program in the computer — the sort of thing I often used in my classes.

However as it stands it's a bit restricted — after all, only a small percentage of my students were called MIKE. What's really needed is some way for the Atari to find out the name of the person so that it can tailor the message to suit.

Program VI fits the bill. The trick here is the use of the INPUT statement in line 50. In Program V, line 40 put the value MIKE into NAMES. In Program VI the variable isn't actually attached to a specific

50 supplies that.

The micro then waits for us to type our reply and send it by pressing Return. Whatever we have typed in then becomes the value of NAMES — even if we have lied!

Line 70 then prints out the message after line 60 prints out a blank line.

The point of all this is that in Program VI, as opposed to Program V, the value of NAMES is not fixed initially, but is decided during the program by the response to INPUT.

This means that every student in the class can now run the program

with what you've typed.

You can use INPUT with numeric variables as well as strings. Program VII demonstrates this. When you get the prompt, try typing in a word rather than a number and see what happens.

```
20 REM PROGRAM VII
20 PRINT CHR$(128)
30 PRINT "First Number":
40 INPUT FIRST
50 PRINT "Second Number":
60 INPUT SECOND
70 PRINT "FIRST* multiplied by ",SECOND
80 " is "FIRST*SECOND
```

Program VII

A slightly more serious application of INPUT allows you to calculate the product of two numbers, as Program VIII demonstrates.

Look carefully at line 70 and see if you can work out what's happening. FIRST isn't in quotes, and so the micro will print the number that FIRST labels. "Multiplied by" is printed literally since it is in quotes.

The numeric variable SECOND is not in quotes — it may have them on either side, but the quotes on the left are already paired with the quotes on the far left, so they don't count. The micro will therefore print out the value of SECOND.

"is" is printed literally, since it is in quotes. FIRST\*SECOND isn't in quotes, so the sum is done and the answer printed out. Figure 1 should help to make this clearer.

Finally, try altering Program VIII so that it adds or subtracts pairs of numbers.

We've covered an enormous amount of ground this month. I suggest that you spend a good while going over the programs. If you are having problems, re-reading the earlier articles will probably help.

Above all, remember it's a "hands-on" course — you can't expect the examples to make sense until you've typed them in!

```
20 REM PROGRAM VI
20 PRINT CHR$(128)
30 REM NAMES=MIKE
40 PRINT "WHAT IS YOUR NAME?";
50 INPUT NAMES
60 PRINT
70 PRINT "GOOD TO SEE YOU ",NAMES
```

Program VI

value — if you like, you give the program a label, but neglect to tell it what it's labelling. Instead you type:

## 50 INPUT NAMES

When the Atari reaches this line it waits until you PUT IN, or INPUT, the value you want NAMES to have by typing the value in.

To put it another way, when the computer meets an INPUT statement followed by a variable, it asks you what you want the variable to be — in fact, it actually puts a question mark on the screen.

You are then supposed to type in the answer followed by Return, which, as always, sends it to the computer, which then carries on with the rest of the program.

So when you run Program VI line 40 asks: "WHAT IS YOUR NAME". Notice that we don't need a question mark — the INPUT statement of line

```
20 REM PROGRAM VII
20 PRINT CHR$(128)
30 PRINT "How old are you?";
40 INPUT AGE
50 PRINT
60 PRINT "I don't believe you are ",AGE
```

Program VII

and have the message tailored to themselves.

Incidentally, line 40 is not strictly necessary, but it is only polite to tell people what kind of response you expect them to make. Otherwise they will be met with just a question mark — not too "user-friendly" as the jargon has it.

The semi-colon at the end of line 40 "glues" the question mark, or prompt, as it is known, to the preceding "message". Running the program with it omitted should make this clear.

Remember, when you run Program VI and it asks for your name, you must type your reply then press Return. If you omit Return the Atari won't receive your answer and will continue waiting. This could be incredibly boring!

If you make a typing mistake before you press Return, you can erase it with Delete. Once you've pressed Return, though, you're stuck

```
70 PRINT  FIRST ;  " multiplied by " ;  SECOND ;  " is " ;  FIRST * SECOND
           ^           ^           ^           ^           ^
           |           |           |           |           |
           variable    in quotes   variable    in quotes   Calculate then
                                     print out answer
```

Figure 1: Mixing variables and strings in PRINT statements

THE first couple of issues of *Atari User* carried an advert for Uramesh's *Psychodelia*.

If you're one of the many people who've been eagerly waiting for *Psychodelia* to appear on the Atari I have some bad news and some good news.

The bad news is that *Psychodelia* isn't going to appear on the Atari. The good news is that Jeff Minter was so pleased with the Atari version he's called it something different — **Colourspace**.

Let's get one thing clear from the start. *Colourspace* is not a game, unlike the rest of Uramesh's catalogue. It's what Jeff calls a light synthesizer, a software toy.

It's also high-on impossible to describe.

If you can imagine an etch-a-sketch connected to a multi-coloured special effects generator, you might be on the right lines.

You "play" it with a combination of the joystick and keyboard to produce incredible coloured displays.

They can be whirlwind rainbows or cool waves flowing endlessly — it's up to you.

As Jeff points out in a glowing eulogy to Atari machines, all this is possible because the display list can tell the Amic chip to build any number of screens.

According to the manual, the difference between *Psychodelia* and *Colourspace* is as pronounced as the difference between a Mini and a Ferrari.

The idea for *Colourspace* grew out of Jeff's interest in rock music and the light shows that accompany rock concerts of the Pink Floyd/Genesis type.

A very comprehensive manual accompanies the tape. It's written in the distinctive Minter style — "Imagine that the cursor is a telepathic messenger" — but actually does describe all the many controls with which the parameters are set or manipulated.

I must admit I didn't read

## Psychodelia by any other name is just as good

the manual at first. I glanced through while the program was loading and then played for quite a while.

I then kept dipping into the manual to discover a new variable and immediately try it out.

The crowd that gathered around sounded like kids on bonfire night. Lots of "Dahh's

and "Aahh's, with a liberal sprinkling of "How does he do that?"

My daughters enjoyed it even more. It has all the computativeness of a kaleidoscope with all the fun of being able to tweak the controls.

You can even record a sequence of about 15 minutes worth in memory and

play it back as an endless loop, or record the parameters and joystick/keyboard dynamics to tape and load them back in at a later date.

Quite simply, *Colourspace* is magnificent. It's Atari graphics at its best and no hippy should be without it. Nice one, Jeff — really zesty.

Cliff McKnight



## HITCH YOUR ATARI TO A STAR GAME

WHAT sort of probability factor would you give to the chances of a cult radio programme going on to become a television series, an LP record, several books, a stage show and is currently being made into a movie?

Highly improbable, right? Well *The Hitchhiker's Guide to the Galaxy*, by Douglas Adams, has not only achieved all of that already. It has gone one step further.

The immensely successful series now features in a brilliant text adventure, written by Douglas Adams himself and programmed by those masters of artificial intelligence at Infocom.

And believe me the result is magnificent. It has already gone straight to the top of the charts and has just picked up the WH. Smith Game of the Year award, probably the first of many such awards.

Hitchhiker looks set to be

one of the all time greats.

Like all Infocom adventures, it is text only, has an immense vocabulary, an amazingly sophisticated input analyzer, screens and screens of fulsome prose, and, because of

the sheer size of the game, comes on disc only.

Even if you've tasted the sweet pleasures of an Infocom adventure before, I guarantee



you'll never have played one like this.

When was the last time you suddenly found yourself transformed into another character partway through the game and found yourself talking to yourself, if you catch my drift?

And that doesn't happen just once, either.

You begin the game as Arthur Dent. Your immediate concern is how to stop the local council bulldozing down your house in order to make way for a by-pass.

However that anxiety soon becomes a trifle insignificant since the Earth itself is about to be destroyed by a Vogan Constructor fleet to make way for a galactic by-pass.

If you are familiar with the books, or radio series, etc., you'll find the opening sequences ringing a few bells. But you can't rely on that knowledge for very long – you are soon confronted with many situations that are going to take more than a little lateral thinking to resolve.

Many of the characters from the series make an appearance. Ford Prefect, Zaphod Beeblebrox, Trillian and Eddie, the ever-cheerful shipboard computer. And, of course, the galaxy just wouldn't be complete without Marvin the paranoid android.

He's still as miserable as ever and his behaviour will surely make you a little paranoid, too.

There's also a host of much-loved subsidiary characters, objects and incidents. Remember the Ravenous Bugblatter Beast of Traal? He's still ravenous and dangerous but very stupid – if you can't see him, he thinks he can't see you.

The awful Vogan captain with his even more awful poetry is here, and so is the Babel fish, the obtaining of which, incidentally, presents one of the most devious but deliciously amusing, multi-layered puzzles I have ever encountered.

It's almost as if the game is

outthinking you every move.

I am not at liberty to reveal just what your ultimate goal in the game is, not that it would help you in the slightest if I did.

But there is one source of help available throughout the game and that's the guide itself.

By typing CONSULT GUIDE ABOUT something, chances are you will glean some useful, and certainly hilarious, information which may, or may not, assist you in your mission.

And even when the guide cannot provide data on the selected topic, you're still sure of a variety of witty responses.

If you really get stuck in the game, don't panic. You could do a lot worse than invest a further £7 in a copy of Infocom's *Invisible book* – concealed hints – for the game.

It is cunningly designed, entertainingly written and great fun in itself. It not only offers help where needed but provides lots of other suggestions to try out when you've finished the game, many of which might never have occurred to you.

The book really does help you to get every last ounce of enjoyment out of the adventure. Only buy it when desperate for help or when you've completed the game, as the temptation to consult the clues is overwhelming.

The game comes with a comprehensive manual and includes your very own piece of fluff, pair of pain-sensitive glasses – totally black – and a microscopic space fleet. You must supply your own towel.

Hitchhiker is zany, original, challenging and entirely and faithfully logical in its own crazy world of logic.

The chances of you finding as funny or as superb a game as this between Earth and Magrathea are two to the power of ten million and rising, so don't bother waiting – hitchhike to your nearest dealer now.

Bob Chappell



## Mr Robot sets a tricky scene

I MUST admit that when I first booted *Mr Robot* my immediate thought was "Ho hum, another levels, ladders and power pills game".

Level 1 presented no difficulty other than determining which jumps were permissible and which were fatal. Level 2 wasn't much harder.

Slowly, though, things started to get a bit trickier. The first sign of trouble came on Level 4 with the bombs. They are not active until you walk on them, whereupon they fizz for a few seconds and then explode.

The problem is that you need to walk on them in order to collect all the power pills. It's a one-way journey – once they've exploded there's nothing to walk on. This means that you've got to plan your route around the screen.

Then come the trampolines to bounce you on your way, the transporter tokens which may jump you out of the microwave oven into the central heating boiler, and of course through all this the Alienfire is still intent on your destruction.

Although the game starts off easy, you can select which level you start from. This means that you don't need to work your way up through levels which you've already mastered.

According to the manual only the first five levels are selectable. However in practice you can select any of 22.

Level 13 is a bonus round

with no obstacles, and I found Level 14 remarkably easy, but there are plenty of "killer" levels to keep you busy.

If you've mastered the levels and think you could design better, you can give it a try.

In addition to the game there is a DIY section called The Robot Factory that lets you create up to 26 of your own screens. These can be saved to a separate disc.

New screens are drawn by picking up pieces with the cursor and simply putting them where you want them. It's very easy. You can play-test your screen and keep editing it until satisfied.

Having the same elements to build with, my screen came out looking very much like the real game screens. However I must admit I'm not very creative when it comes to such matters.

If you've a flair for design you could probably combine the elements in a more creative way.

*Mr Robot* is an American import from Dataeast and is being distributed in this country by Zoomsoft. It is only available on disc at £14.95.

This may seem a bit expensive. However, when you consider the game's 22 levels and the facilities to build an extra 26 levels it's likely to last you for a bit longer than the average levels and ladders game.

Dave Russell



IN today's male chauvinist world it makes a change to see a game written by a woman—or should I say a female person?

Activision's **River Raid** was written by Carol Shaw and is proof of the fact that women have as much to contribute to computing as men.

The river of the title is divided into sections with a bridge at each end. Your job is to fly your plane up the river and destroy the bridges.

You're constantly moving forward, or rather the screen is constantly scrolling downward, and there are various obstacles to your progress—ships, helicopters and so forth.

You're also using up fuel, but fortunately the river is littered with fuel dumps. You need only fly over them to refill and you can blow them up and earn points if you don't need to top up.

As you get past more and

## Carol drops a bombshell or two into a man's world



more bridges the obstacles get more frequent, the nasties get more aggressive and the fuel dumps scarcer.

In fact, as you gather from my description, there's nothing

that you'd call innovative about **River Raid**. However, it does have several things to recommend it.

Firstly the game is well implemented. Scrolling is

smooth even at high speed, response to the joystick is good without being over-sensitive, and the colours are crisp and clear.

Secondly there are options to start at bridges 1, 5, 20 or 50. This means that once you've got the hang of the game you can leap straight in without having to go through the easy sections.

It's also a very fair game. If you destroy a bridge but get killed off before you fly past it you start your next life from that bridge rather than the previous one.

As an arcade fan I enjoyed **River Raid**. It's accessible enough at lower levels to allow you to get accustomed to it, but challenging enough at higher levels to hold your interest.

**Pet Cookson**

## Pining for Nevada with Pac-Man

I FIRST discovered Pac-Man in Las Vegas (*Whee a name-dropper, Ed!*). While all around me were pumping money into one-armed bandits, I was supporting the local arcade machine looting company.

It's an addiction that has stayed with me throughout the years. I've played the game on a variety of machines and for more hours than I care to admit and I still love it.

Imagine my delight then, to get a review copy of US Gold's release of **Pac-Man** under licence from Datasoft.

It's described as "the official version of the arcade classic" and is about as close as you can come to the original without actually spraying light

alle around the room for effect. I was pining for the Nevada desert after a few games.

If you don't know what Pac-Man is, I hope you've been very happy in the monastery or convent for the last five years. Like *Space Invaders*, the game has become part of the micro industry folklore, so I shouldn't need to describe it.

Suffice to say that in the unlikely event of your software collection not containing a version of the game, you should buy this one.

The tape will cost you £9.95 and the disc is £14.95. Either way it's a lot cheaper than going to Las Vegas.

**Cliff McKnight**



## —ANDRE WILLEY—

**takes a long hard look at Atari's new half megabyte superstar model 520ST ... and likes very much what he sees**

**THE new range of Atari machines are probably the most talked-about forthcoming items in the home computer world. The American magazine have been bubbling over with enthusiasm, and the expectations built up so far will be hard to match up to. After all, there MUST be a catch, mustn't there?**

A 512k machine with the M88000 running at 8MHz, a half megabyte 3.5 inch drive, mouse, GEM with 512 colours, Basic and Logo built in, high-res monitor, Gem-Point and Gem-Write included ... and all for £750?

Well, I'm happy to report that it meets and far surpasses all of my expectations. Let's first re-cap on the general information about the 520ST. It will be part of a whole range of computers — the new generation of Atari micros — and it seems as far ahead of its time now as the 400 and 800 were when they were released.

The old range used the now long-in-the-tooth 8 bit 6502 chip, but the ST runs on the Motorola 68000 processor. It also runs at a little over four times the speed of the 6502, and has so many functions built in that I go a little green with envy every time I read the chip manual.

Atari has thankfully used the full version of the 68000 — with 16 bit address lines. The Sinclair QL, on the other hand, uses an 8 bit version of the chip — guaranteed to slow programs down dramatically. Perhaps QL stands for Ouseer Logic?

The main board is superbly designed, as we have come to expect from the new Atari team.

The chip count has been kept down by packing many operations normally requiring a number of chips on to single, custom designed super chips.

I won't cover the technical details of all the ones used, but they include high-speed memory management, graphics and OMA management chips — Atari custom design — two serial output chips for the RS-232 and Midi ports, a separate micro processor to run the keyboard and the on-board clock.

Then there's a Yamaha sound chip complete with three voices, AOSR, a controller for running up to two disc drives, and another for the hard disc interface. Plus six 32k ROM chips containing Gem, Basic, Logo, and so on, and 16 chips to provide the 512k RAM.

The system ROM chips are not yet complete — they should be ready this month, ready for the main release at the PCW show in September — so the machine I got my hands on booted Gem from disc. Assuming that the full 192k was booted, the floppy disc drive seems quite fast.

Normally Gem will greet you at power-up with its main Desktop window. The concept of "windows" may be new to most of you, but they're basically very simple and useful.

Imagine a window as being a screen display — just like the one you see on your Atan now. However you can have many windows on one display, and move and change them at will.

To do this the mouse comes into play. The Atari mouse is a two-button affair which will copy any movement

you make with it on to the screen.

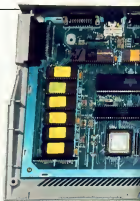
To access a function you simply point the mouse at the relevant icon — computer jargon for picture — and press one of the buttons. Up pops a new window, containing all of your choices for that function.

I only touched the keyboard once during my session with this machine — and that was to test the feel of it. It is a similar type to that used on the 130XE, which I am quite keen on.

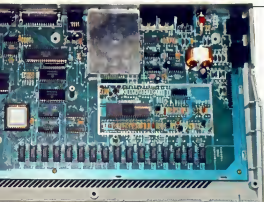
In addition to the main query segment, there is a cursor key section and a full numeric keypad.

Incidentally, if your mouse breaks down you can use the cursor keys to control Gem, but normally the mouse makes the system so user-friendly that the claim that anyone could start to use it immediately is not unjustified.

The great thing is that, unlike most



# SUCCESS, with a capital



520ST... the index story

# ST

user-friendly systems, Gem will not also hold back an experienced user.

Gem itself handles everything that DOS does on your old machine – and a lot more, too. You can get a directory in pictures, or text – and even sorted by name, type, size, or date created. This may be from any attached disc drive, and will be displayed in a window.

If the window is not big enough, or it obscures something else you wanted to read, you can grab the corner with your mouse and drag it all over the screen, change its size – to full screen, if necessary – and scroll the information within the window in any direction.

You can even open another window over the top of it and get the first one back intact whenever you want.

I was, however, most disappointed

that Gem does not make toast, and the kitchen sink implementation was rather poor...

The icons try to show you what each file is – and you can define your own icons once you get into programming.

A file is displayed as just that – a file.

You can put any number of files into a "folder", and even put folders and files into other folders. This is akin to sub-directories and path-following, but without the hassle this usually involves.

If you want to copy a file from one folder to another you can simply open directory windows for each folder, grab the file you want by pressing your mouse button while over it, drag it into the other window, and release the button.

To copy a file onto another disc,

just grab the file and pop it into the icon for drive B. Simple as that. If you decide you don't want a file, just drag it over to the trash can and drop it in. After a quick double-check, bingo it's gone.

Anyone who has had the misfortune to use an IBM to do some of these sort of tasks will realise just how amazing Gem is.

All of these functions could run on a standard TV set, if required, but the ST is capable of much more, and indeed is provided with a high-res monitor as standard.

The lowest display resolution is  $320 \times 200$ , which is the same as Graphics 8 with no text window on the current Atari range, but can display up to 16 colours.

Medium resolution, which wouldn't look too good on a TV set as it uses an 80 column display, gives  $620 \times 200$  with four colours.

If you use the monochrome high-res monitor provided with the system you can use the maximum resolution of  $620 \times 400$ . This is slightly higher than that of the Macintosh, but only gives you two colours.

The machine will sense which type of monitor you have and adjust itself accordingly at power-up, although you can pull down a menu to change resolution at will and even save your configuration to disc for next time.

The 512 colour palette can be selected from by using another pull down menu, and you just push the Red, Green and Blue sliders to the level you require. No more trying to remember complex SETCOLOR numbers.

Other pull-down functions include a mini-terminal emulator for the RS-232 port, a calculator and notepad, disc set-up menus, and other system configuration details such as clock setting, mouse speed,

and even an alarm clock.

I have not had a chance to see Personal Basic on the ST yet, but if it's anything like Logo it should be great. Both Logo and Basic will be in ROM and still support all of the user-friendly features of Gem.

Logo, and Basic, I'm told, has three main windows, and will let you define others as you need them.

You will program in the editor window, see your graphics in the graphics window (surprise, surprise...) and use the dialog window to receive communications from Logo.

As before, Gem will allow you to move and change the windows as required.

Set up and run a program in one window, and while it's running and rushing its turtle all over the place good old Gem can multitask and you can pull the graphics window over the whole screen – all of this with no noticeable difference in speed of program execution.

From what I've heard, DR's Personal Basic will allow the same sort of facilities. Just imagine, programs and graphics wherever you want them – watch the listing while the program is running. It's like having two TVs going at the same time, each having the resolution of full-screen Graphics B. When final versions of Basic and Logo are ready, we'll give them a full bench test.

Gem is packed with useful facilities for the programmer, far too many to list here, but they include routines for mouse control, window management and disc control.

Another useful facility is the Gem VDI – that's Virtual Device Interface – a way to generalise control of lots of different types of peripheral, so your program can send information to any of them in the same basic format, and Gem will deal with how each unit handles graphics, text, and so on.

This VDI includes routines for handling different text fonts and sizes, graphics of any description – including bar and pie charts, even in 3D, drawn automatically, circles, arcs, ellipses, lines, polygons, pattern-filled areas and much more.

Because VDI is device independ-

## THE ATARI ST RANGE

**520ST (512k)** including high-res monitor, half-Meg drive, mouse and bundled software: £750.

**260ST (256k)** with built in 500k drive, mouse and software: £500.

**FS354 (500k)** 3.5 inch disc drive: £150

**FS314 (1M)** 3.5 inch disc drive: £?

**Hard disc** 10m-20m storage: £400-£500.

**CD ROM** compact disc giving a massive 550mbytes of read-only storage space: £?

*Software should range from about £50 to something over £100, although I'm sure that there will be lots of games software at very much lower prices.*

dent, the same set of commands used to generate the display on screen could be sent to a printer or plotter, in colour if your peripheral handles it.

And if you don't want to bother with that, Gem has a screen dump facility anyway. Configurable to any printer type, of course.

All of these facilities are easily accessible from assembly or high level languages, although I don't know how Basic will interact with Gem. It may have commands for some of the above, but probably many of them will have to be accessed by some form of CALL or

USR command.

In addition to these Gem-based features, the machine will support both vertical-blank and horizontal-blank interrupts – useful for synchronising programs to the screen display, and for critical timing requirements.

Sprites are supported by means of the high speed memory management chips, rather than by separate hardware devices.

Screens can also be defined in more than one logical plane for various effects and colour combinations.

Having dealt with how the machine interacts with the user, how does it fare in terms of other contacts with the real world?

Well the back of the ST is crammed with almost every imaginable connection you could want, bar one.

From left to right, we have the power socket, with adjacent power switch and reset button, two Midi ports – IN and OUT – for computer control of single or multiple synthesisers, the TV output and the monitor output, giving analog RGB, composite colour, high-res monochrome and audio, the printer port, a bidirectional Centronics connector, the RS-232 serial port, the floppy disc port for up to two parallel drives, and finally the hard disc interface – which can supposedly transfer data at an astounding 1.3mbytes per second.



On the left side of the machine is a ROM cartridge socket capable of taking an extra 128k of ROM. The right side features two joystick ports, one doubling as the mouse port.

That's a lot of connections for any machine, and it's quite astounding to have that sort of versatility on a low price micro. The missing socket I mentioned would be an expansion port for extra RAM.

I know that 512k seems a lot, but there's a rule within the computer industry which states that when writing any given program it will quickly expand to fill all available memory. This applies especially to databases and word processors.

Hopefully some clever company will design a RAM pack to fit either the hard disc port or the ROM socket.

Unfortunately at this stage it is not possible to fully review and test any of the applications software or languages. The development systems being shipped to software houses by Atari do not include Gem-Write or Gem-Print or even Basic, but these will be available in the next few months.

Software houses, of course, do get such things as a C compiler, linker, 68000 assembler and an editor, plus a few thousand pages of documentation.

It will take them quite a while just to wade through the paperwork, but at least there should be some software under development by now.

Hopefully, according to Atari, anyway, there will be about 100 titles available by September for the PCW Show.

That may be a little optimistic, but assuming the software houses are as enthusiastic as they all seem to be, there should be a few completed programs, mostly business orientated, plus many others in various stages of development.

Now for the 64 million dollar question - when can you buy one? The current position, and this may well have changed again before you even read this, is that the first batch of machines, most of which have now been dispatched, went to software houses at about £1,200 for a

development system.

More machines were due to arrive in the UK at the end of July, these being available to major retailers and specialists, but in very limited quantities.

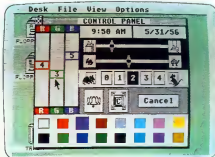
You probably won't be able to actually BUY one of these, but perhaps your local user group can get one, and you can at least have a good look for yourself.

The main launch, by which time a good stock of machines should have arrived, will be at the PCW Show in September, and retailers should get their stock at that time. But who

knows? Read next month's thrilling instalment for a complete change of plans.

I know that many of you will be waiting, like me, with bated breath to buy an ST, and from what I've seen of it, the competition had better watch out, too.

Who in their right mind would buy a BBC B+ at £468 - then spend £250 on a monitor and £150 on a disc drive, when a machine with far better facilities and over 10 times the memory can be brought for £100 less? And as for the Sinclair Quality Lapse, well...



SO far in this series we've looked at the text modes obtained using Graphics 0, 1 and 2. This month we'll start in on the actual graphics modes, or map modes as they're sometimes called.

Modes 3, 5 and 7 can be conveniently taken together because they are all four-colour modes. They differ in the size of the smallest block, or pixel, that can be placed on the screen. That is, they offer different levels of resolution and therefore make different demands on memory space.

The pixels in a Mode 3 screen are the same size as those of Mode 0. If you type:

#### GRAPHICS 3

most of your screen will go black and you'll be left with the familiar blue text window at the bottom.

You now have 20 rows of 40 columns on which you can produce your display. Before we start trying to put anything up there, let's get the colour registers sorted out in our minds.

I often think that the designers of the Atari and the writers of the Basic were kept apart in order to produce as many different numbering systems as possible.

I'm not always this cynical — it comes over me when I try to remember all the different schemes for selecting a colour.

Registers 0, 1 and 2 hold the information for the foreground colours and register 4 holds the information for the background colour.

Register 4 defaults to black while registers 0, 1 and 2 default to orange, light green and dark blue respectively.

We can use the SETCOLOR command to alter these colours. With a clear Graphics 3 screen, try typing:

#### SETCOLOR 4,13,0

The black background should have been replaced by darkish green because you have changed register 4 to colour 13 with luminance of 0.

When we want to put something on the screen, the COLOR command selects which of the registers to take the colour information from.

It's here where the numbering

# Getting to grips with the graphics modes

**Part Four of DAVE RUSSELL's series on the Atari graphics modes**

starts getting tied in knots, because COLOR 0 selects the background colour information in register 4.

COLOR 1 selects register 0, COLOR 2 selects register 1 and COLOR 3 selects register 2. As you can see, for these three registers the COLOR number is one more than the register it selects.

It's not difficult, but it could have been simpler.

At this point I suggest you press Reset to get back to default conditions and then type GRAPHICS 3 (or GR.3 to save a bit of typing). Now let's put something up there.

Try typing:

#### COLOR 1: PLOT 15,15

This should yield an orange square fairly close to the text window.

The COLOR 1 selects the colour in register 0 (orange) and the PLOT 15,15 fills the pixel at screen position 15,15 with a block of this colour.

Press Reset again and try entering Program 1. When you Run it, two

things should be demonstrated. Firstly, the size of the orange block gets smaller as we move from Mode 3 through Mode 5 to Mode 7. In other words, Mode 7 has higher resolution than Modes 3 or 5.

Secondly, the orange square 'moves' up towards the top left-hand

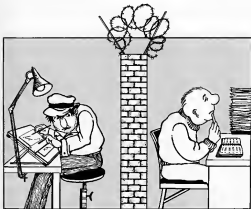
```
10 FOR A=1 TO 7 STEP 2
20 GRAPHICS A
30 COLOR 1:PLOT 15,15
40 FOR DELAY=1 TO 200:NEXT DELAY
50 NEXT A
```

Program 1

corner as the mode changes. This illustrates that screen position 0,0 is actually at the top corner.

For many people it seems more natural to think of 0,0 as being the bottom left-hand corner. You'll have to remember this or your displays will have a nasty habit of appearing upside-down.

If you've run Program 1 you'll be



*1 often think the designers of the Atari and the writers of the Basic were kept apart in order to produce as many different numbering systems as possible...."*

left in Mode 7 so press Reset and go back to GRAPHICS 3.

If you enter:

**COLOR 1: PLOT 15,15**

again you'll once more have the orange square.

Inspirational, isn't it?

In addition to the PLOT command, the other main command for producing displays in these modes is DRAWTO. As you might imagine, this command causes a line to be DRAWn from the last PLOTted position to the specified position.

If you enter DRAWTO 15,4 a vertical orange line should appear. Try DRAWTO 20,4 to produce a horizontal line.

If you now enter DRAWTO 30,15 you'll see how sloping lines are produced — not very well in a low resolution mode like this, but it's often adequate.

Program II shows how you can produce simple displays using this

method. It's all in the same colour, but if you add a line:

**25 COLOR 2**

you can change the colour used by lines 30 and 40.

You can also change the mode number in line 10 to either 5 or 7 and see the effect of increasing resolution.

Because Mode 3 has the same pixel size as Mode 0, the bottom right-hand corner of a Mode 3 screen is position 39,19. If you try to PLOT 39,20 you won't see anything happen because the text window is effectively covering row 20.

However, if you try to PLOT 40,19 you'll get an ERROR 141 telling you that the cursor is out of range.

In Mode 5 the bottom right-hand corner is position 79,39 and in Mode 7 it is 159,79. But while Mode 3 needs only 434 bytes of memory, Mode 5 needs 1174 bytes and Mode 7 needs 4190 bytes. As you can see, the extra resolution costs memory.

You don't need to specify a particular screen point in the PLOT command. You can provide PLOT with an expression to evaluate, the result of which will give the position to be plotted.

Program III gives a brief example

of this. We can't say where each point will be plotted until the random number generator has been used twice.

You can also print to the screen using the PRINT#6 format that we used in Modes 1 and 2. The only difference is that you can't print an

```
10 GRAPHICS 3
20 COLOR 1
30 FOR R=1 TO 20
40 PLOT INT(RND(1024)*1),INT(RND(1024)*1)
50
60 NEXT R
```

Program III

actual character like a letter or number.

Being a map mode, pixels are either lit (in a colour) or unlit (in the background colour).

To demonstrate the effect, press Reset and enter GR3 to get a clear Mode 3 screen. Now type:

**POSITION 15,15:PRINT#6,"1"**

and you should see the orange square that we started from. Try substituting a 2 or a 3 for the 1 and see the effect.

There are times when it's easier to use the PRINT#6 than PLOT and DRAWTO. Program IV produces a chunky Mode 3 display using a combination of the two methods.

It's not brilliant programming but it might give you some ideas while you're hanging around waiting for the postman to deliver the next issue of *Atari User*.

```
10 REM 05:03,05:03,05:03
20 RS="11111111111111111111"
30 GRAPHICS 3
40 COLOR 1:PLOT 15,15
50 DRAWTO 10,1:DRAWTO 19,1:DRAWTO 19,2
60 FOR R=1 TO 8
70 POSITION 10,R:PRINT#6;RS
80 NEXT R
90 FOR R=7 TO 10
100 POSITION 17,R:PRINT#6;RS
110 NEXT R
120 FOR R=11 TO 14
130 POSITION 17,R:PRINT#6;RS;" "
140 NEXT R
150 POSITION 14,7:PRINT#6;RS
160 POSITION 22,7:PRINT#6;RS
170 POSITION 10,15:PRINT#6;RS;" "
180
```

Program IV

```
10 GRAPHICS 3
20 COLOR 1:PLOT 15,5:DRAWTO 19,14
30 PLOT 17,5:DRAWTO 17,11:DRAWTO 14,14
40 PLOT 21,5:DRAWTO 21,11:DRAWTO 24,14
```

Program II



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**Information Databases:** Various charges

*Any charges that may be applicable are shown to you before you submit access to the database*

**MicroLink PS6 services:** 2p per minute or part (300 baud), 2.5p per minute or part (1200/75 baud)

*(Only applies to users outside the BT London call area)*

**Telex registration:** £10

**Outgoing telex:** 5.5p per 100 characters (UK), 11p per 100 (Europe), 16.5p per 100 (IN America), £1.15 per 600 (Rest of world), £2.75 per 400 (5 days of use)

*Deferred messages sent on the night session are subject to a 20 per cent discount*

**Incoming telex:** 50p for each correctly addressed telex delivered to your mailbox. Obtaining a mailbox reference from the sender incurs a further charge of 50p

*If it is not possible to deliver a telex without a mailbox reference, if a telex is received without a mailbox reference the sender will be advised of non delivery and asked to provide a mailbox address.*

*Each user validated for telex and using the facility will incur a charge of 6 storage units a month. Further storage charges could be incurred depending on the amount of telex storage and the use made of short code and message file facilities*

**Telemessages:** £1.25 for up to 350 words

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*If you have a BT Radiopager you can be paged automatically whenever a message is waiting in your mailbox.*

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*These charges relate to the transmission of information by the Database service to other Database services outside the UK and the Isle of Man. Multiple copies to addresses on the same system that incur only one transmission charge*

**Billing and Payment:** All charges quoted are exclusive of VAT. Currently all bills are rendered monthly

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MicroLink is setting up a central store of software programs which you'll be able to download directly into your micro. The range will include games, utilities, educational and business programs, and will cover all the most popular makes of micros.

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MicroLink is part of the International Dicom network. In the USA, Australia and a growing number of other countries there are many thousands of users with electronic mailboxes just like yours. You can contact them just as easily as you do users in Britain – the only difference is that the messages from your keyboard go speeding around the world via satellite.

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You must have three things in order to use MicroLink: a computer (it can be any make of micro, hand-held device or even an electronic typewriter provided it has communications facilities), a modem. It can be a simple Prestel type using 1200/75 baud, or a more sophisticated one operating at 300/300 or 1200/1200 baud, and appropriate communications software.

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The best hardware deserves the best

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But first, send for the Miracle package – and enter the fascinating, limitless world of communications!

**Use the order form on Page 61**

# Don't you think you need a little protection?

**ANDRE WILLEY**  
makes you  
an offer  
you can't  
refuse...

**ONE of the main problems with Basic, apart from its poor speed in comparison with machine code, is that once you've finished your masterpiece anyone can LIST it to the screen or printer and copy your ideas.**

We've had a number of letters asking if there are any ways to prevent someone from pressing Break or System-Reset and LISTing the program, and luckily there are quite a few things you can do.

Let's take the points in order:

Break is perhaps the easiest of all to protect from. It involves just two POKE instructions:

**POKE 16,64  
POKE 53774,64**

To switch the Break key back on again, type:

**POKE 16,192  
POKE 53774,192**

Unfortunately the GRAPHICS command will return Break to its normal use, so you must re-POKE the values after each GRAPHICS statement in your program. A simple GOSUB to a subroutine is probably best.

System-Reset is far harder to protect because it was designed as an all purpose "get-out" key in case your program goes wrong. As such it should function correctly regardless of whatever you have managed to type in.

Luckily there is one way to "capture" the Reset key. One of the functions of Reset is to check that DOS or any cassette loaded program

is still working correctly.

When a boot cassette or DOS disc loads in it will set three locations in memory to tell Reset what to do to re-initialise the program just loaded.

Location 9 will contain either a 1, for a disc program, or a 2 for cassette. If it contains 0 then no program was booted.

The other two locations are used to tell the computer the address in memory of a small machine code routine to handle the job of checking the main booted program.

These locations are different for cassette and disc, but we will use the cassette ones, 2 and 3, as they are simpler.

So in order to trap System-Reset we must first POKE location 9 with 2 - for cassette boot - and locations 2 and 3 with the address of a machine code routine?

What? You mean that some of you aren't machine-code programmers? Okay, let's cheat.

Basic itself is really just one massive machine code program. Normally you never have to think of it as such, because it is designed in such a way that you never really notice how it works.

If we could find a suitable section of Basic to "borrow", we wouldn't have to write any machine code ourselves.

The obvious routine to use would be RUN, so that the program would simply re-start if you pushed Reset.

But that may not be what you wanted. You may want your program



```

10 REM PROGRAM LISTING 2
20 REM PROTECTS PROGRAM FROM BEING AND
  SYSTEM-RESET
30 REM VERSION FOR Atari XL/XE
  COMPUTERS
40 REM FOR Atari 400/600 COMPUTERS,
  CHANGE LINE 128 TO POKE 2,64
50 REM
100 REM PROTECT FROM SYSTEM RESET
110 TRAP 200
120 POKE 2,64
130 POKE 3,192
140 POKE 9,2
150 POKE 251,255:REM DOES POKE-LOCK
  ON XL/XE MACHINES
120 GRAPHICS 9:GOSUB 1800:REM "RECAP"
  KEY...
200 PRINT " PROGRAM LOADING BEGINS..."
  
```

Program 1

to go off and do something else rather than start from scratch.

Fine, let's use the GOTO statement then, but how to tell the computer where to go to? Better still, let's use the TRAP command.

If we can convince Basic that an error has occurred after pushing Reset it will jump to a TRAPPED line, which may, for instance, disable the Break key again. For instance, if you have typed:

### TRAP 500

the program would continue at line 500 after pressing System-Reset. So where inside Basic is the TRAP handling routine?

Atari has so far released three revisions of its Basic, called, with great inspiration, A, B and C.

Version A was shipped in cartridge form with all UK Atari 400 and 800 machines. There were a few very minor problems with it so the new 800XL and 800XL machines had Revision B Basic built in.

Unfortunately one or two new bugs crept in to this one also, so Revision C was born. Available on cartridge for £9.95, this Basic is also built into the correct XE range of computers.

The TRAP routine on Rev. A was located at 47424 (\$B940), and on Revs. B and C at 47412 (\$B934). Thus you must PDKE locations 2 and 3 with the correct values:

For Basic Rev. A - cartridge:

**POKE 2,84  
POKE 3,185**

For Basic Revs. B and C - XL/XE range:

**POKE 2,52  
POKE 3,185**

Don't, incidentally, forget to POKE 9,2 as well.

Program I shows Break and Reset protection in use.

This method will disable DOS after Reset is pushed. If you are a disc user and you wish to re-enable DOS, type PDKE 9,1 and push System-Reset. The system should then be returned to normal.

There are some rather nice little things you can do to stop your

**WHICH version of Basic have you got? If you have Basic Rev. A, typing PRINT PEEK(47424) will give a result of 169.**

**If you have Basic Rev. B or C, typing PRINT PEEK(47424) will give a result of 133, but PRINT PEEK(47412) will print 169.**

**Any other results from these PEEKs and the Reset protection routine will almost certainly not work.**

program being LISTed if it has been loaded but not RUN.

The first is to scramble any variable names so that garbage is printed out instead. Program II will do this for you.

It should be typed in on a spare program line, say 32000, run with a

GOTO statement, and then deleted. Don't forget to save an original version because even you won't be able to read or alter your program once it's been scrambled.

Without going into too much technical detail, for which see "The Atari Basic Source Book", or "Mapping the Atari", both from Compute! Books, it works by putting a Retum character instead of each variable name in the listing of the program, thus making it a little tricky to read.

Program III is even more dramatic. This one won't allow any commands to be typed in after the routine has been run, hence the SAVE command must be in the running portion of the program or you've lost it forever.

This also means that you can't LOAD, or CLOAD, then RUN the program. You must RUN C: or RUN D:Filename. Ext.

Again, I won't go into technical details, but this version will make Basic fail to recognise any lines, either program or command, that you subsequently type in. It effectively forgets where to store them.

Dramatic, but quite effective.

One last tip to play about with. Try this:

### POKE 202,1

Put it as the first line of the program, and check that it is correct by Listing it. Try listing it again after you've RUN the program.

You'd better save the program before running that last one. Have fun.

```

1000 PRINT "PRINT = THE PRESSING MIND"
1010 GOTO 1000
1020 FOR I=1 TO 1000:PRINT I
1030 IF I=1 THEN GOTO 1000
1040 FOR J=1 TO 1000:PRINT J
1050 FOR K=1 TO 1000:PRINT K
1060 FOR L=1 TO 1000:PRINT L
1070 FOR M=1 TO 1000:PRINT M
1080 FOR N=1 TO 1000:PRINT N
1090 FOR O=1 TO 1000:PRINT O
1100 FOR P=1 TO 1000:PRINT P
1110 FOR Q=1 TO 1000:PRINT Q
1120 FOR R=1 TO 1000:PRINT R
1130 FOR S=1 TO 1000:PRINT S
1140 FOR T=1 TO 1000:PRINT T
1150 FOR U=1 TO 1000:PRINT U
1160 FOR V=1 TO 1000:PRINT V
1170 FOR W=1 TO 1000:PRINT W
1180 FOR X=1 TO 1000:PRINT X
1190 FOR Y=1 TO 1000:PRINT Y
1200 FOR Z=1 TO 1000:PRINT Z
1210 FOR AA=1 TO 1000:PRINT AA
1220 FOR AB=1 TO 1000:PRINT AB
1230 FOR AC=1 TO 1000:PRINT AC
1240 FOR AD=1 TO 1000:PRINT AD
1250 FOR AE=1 TO 1000:PRINT AE
1260 FOR AF=1 TO 1000:PRINT AF
1270 FOR AG=1 TO 1000:PRINT AG
1280 FOR AH=1 TO 1000:PRINT AH
1290 FOR AI=1 TO 1000:PRINT AI
1300 FOR AJ=1 TO 1000:PRINT AJ
1310 FOR AK=1 TO 1000:PRINT AK
1320 FOR AL=1 TO 1000:PRINT AL
1330 FOR AM=1 TO 1000:PRINT AM
1340 FOR AN=1 TO 1000:PRINT AN
1350 FOR AO=1 TO 1000:PRINT AO
1360 FOR AP=1 TO 1000:PRINT AP
1370 FOR AQ=1 TO 1000:PRINT AQ
1380 FOR AR=1 TO 1000:PRINT AR
1390 FOR AS=1 TO 1000:PRINT AS
1400 FOR AT=1 TO 1000:PRINT AT
1410 FOR AU=1 TO 1000:PRINT AU
1420 FOR AV=1 TO 1000:PRINT AV
1430 FOR AW=1 TO 1000:PRINT AW
1440 FOR AX=1 TO 1000:PRINT AX
1450 FOR AY=1 TO 1000:PRINT AY
1460 FOR AZ=1 TO 1000:PRINT AZ
1470 FOR BA=1 TO 1000:PRINT BA
1480 FOR BB=1 TO 1000:PRINT BB
1490 FOR BC=1 TO 1000:PRINT BC
1500 FOR BD=1 TO 1000:PRINT BD
1510 FOR BE=1 TO 1000:PRINT BE
1520 FOR BF=1 TO 1000:PRINT BF
1530 FOR BG=1 TO 1000:PRINT BG
1540 FOR BH=1 TO 1000:PRINT BH
1550 FOR BI=1 TO 1000:PRINT BI
1560 FOR BJ=1 TO 1000:PRINT BJ
1570 FOR BK=1 TO 1000:PRINT BK
1580 FOR BL=1 TO 1000:PRINT BL
1590 FOR BM=1 TO 1000:PRINT BM
1600 FOR BN=1 TO 1000:PRINT BN
1610 FOR BO=1 TO 1000:PRINT BO
1620 FOR BP=1 TO 1000:PRINT BP
1630 FOR BQ=1 TO 1000:PRINT BQ
1640 FOR BR=1 TO 1000:PRINT BR
1650 FOR BS=1 TO 1000:PRINT BS
1660 FOR BT=1 TO 1000:PRINT BT
1670 FOR BU=1 TO 1000:PRINT BU
1680 FOR BV=1 TO 1000:PRINT BV
1690 FOR BW=1 TO 1000:PRINT BW
1700 FOR BX=1 TO 1000:PRINT BX
1710 FOR BY=1 TO 1000:PRINT BY
1720 FOR BZ=1 TO 1000:PRINT BZ
1730 FOR CA=1 TO 1000:PRINT CA
1740 FOR CB=1 TO 1000:PRINT CB
1750 FOR CC=1 TO 1000:PRINT CC
1760 FOR CD=1 TO 1000:PRINT CD
1770 FOR CE=1 TO 1000:PRINT CE
1780 FOR CF=1 TO 1000:PRINT CF
1790 FOR CG=1 TO 1000:PRINT CG
1800 FOR CH=1 TO 1000:PRINT CH
1810 FOR CI=1 TO 1000:PRINT CI
1820 FOR CJ=1 TO 1000:PRINT CJ
1830 FOR CK=1 TO 1000:PRINT CK
1840 FOR CL=1 TO 1000:PRINT CL
1850 FOR CM=1 TO 1000:PRINT CM
1860 FOR CN=1 TO 1000:PRINT CN
1870 FOR CO=1 TO 1000:PRINT CO
1880 FOR CP=1 TO 1000:PRINT CP
1890 FOR CQ=1 TO 1000:PRINT CQ
1900 FOR CR=1 TO 1000:PRINT CR
1910 FOR CS=1 TO 1000:PRINT CS
1920 FOR CT=1 TO 1000:PRINT CT
1930 FOR CU=1 TO 1000:PRINT CU
1940 FOR CV=1 TO 1000:PRINT CV
1950 FOR CW=1 TO 1000:PRINT CW
1960 FOR CX=1 TO 1000:PRINT CX
1970 FOR CY=1 TO 1000:PRINT CY
1980 FOR CZ=1 TO 1000:PRINT CZ
1990 FOR DA=1 TO 1000:PRINT DA
1000 FOR DB=1 TO 1000:PRINT DB
1010 FOR DC=1 TO 1000:PRINT DC
1020 FOR DD=1 TO 1000:PRINT DD
1030 FOR DE=1 TO 1000:PRINT DE
1040 FOR DF=1 TO 1000:PRINT DF
1050 FOR DG=1 TO 1000:PRINT DG
1060 FOR DH=1 TO 1000:PRINT DH
1070 FOR DI=1 TO 1000:PRINT DI
1080 FOR DJ=1 TO 1000:PRINT DJ
1090 FOR DK=1 TO 1000:PRINT DK
1100 FOR DL=1 TO 1000:PRINT DL
1110 FOR DM=1 TO 1000:PRINT DM
1120 FOR DN=1 TO 1000:PRINT DN
1130 FOR DO=1 TO 1000:PRINT DO
1140 FOR DP=1 TO 1000:PRINT DP
1150 FOR DQ=1 TO 1000:PRINT DQ
1160 FOR DR=1 TO 1000:PRINT DR
1170 FOR DS=1 TO 1000:PRINT DS
1180 FOR DT=1 TO 1000:PRINT DT
1190 FOR DU=1 TO 1000:PRINT DU
1200 FOR DV=1 TO 1000:PRINT DV
1210 FOR DW=1 TO 1000:PRINT DW
1220 FOR DX=1 TO 1000:PRINT DX
1230 FOR DY=1 TO 1000:PRINT DY
1240 FOR DZ=1 TO 1000:PRINT DZ
1250 FOR EA=1 TO 1000:PRINT EA
1260 FOR EB=1 TO 1000:PRINT EB
1270 FOR EC=1 TO 1000:PRINT EC
1280 FOR ED=1 TO 1000:PRINT ED
1290 FOR EE=1 TO 1000:PRINT EE
1300 FOR EF=1 TO 1000:PRINT EF
1310 FOR EG=1 TO 1000:PRINT EG
1320 FOR EH=1 TO 1000:PRINT EH
1330 FOR EI=1 TO 1000:PRINT EI
1340 FOR EJ=1 TO 1000:PRINT EJ
1350 FOR EK=1 TO 1000:PRINT EK
1360 FOR EL=1 TO 1000:PRINT EL
1370 FOR EM=1 TO 1000:PRINT EM
1380 FOR EN=1 TO 1000:PRINT EN
1390 FOR EO=1 TO 1000:PRINT EO
1400 FOR EP=1 TO 1000:PRINT EP
1410 FOR EQ=1 TO 1000:PRINT EQ
1420 FOR ER=1 TO 1000:PRINT ER
1430 FOR ES=1 TO 1000:PRINT ES
1440 FOR ET=1 TO 1000:PRINT ET
1450 FOR EU=1 TO 1000:PRINT EU
1460 FOR EV=1 TO 1000:PRINT EV
1470 FOR EW=1 TO 1000:PRINT EW
1480 FOR EX=1 TO 1000:PRINT EX
1490 FOR EY=1 TO 1000:PRINT EY
1500 FOR EZ=1 TO 1000:PRINT EZ
1510 FOR FA=1 TO 1000:PRINT FA
1520 FOR FB=1 TO 1000:PRINT FB
1530 FOR FC=1 TO 1000:PRINT FC
1540 FOR FD=1 TO 1000:PRINT FD
1550 FOR FE=1 TO 1000:PRINT FE
1560 FOR FF=1 TO 1000:PRINT FF
1570 FOR FG=1 TO 1000:PRINT FG
1580 FOR FH=1 TO 1000:PRINT FH
1590 FOR FI=1 TO 1000:PRINT FI
1600 FOR FJ=1 TO 1000:PRINT FJ
1610 FOR FK=1 TO 1000:PRINT FK
1620 FOR FL=1 TO 1000:PRINT FL
1630 FOR FM=1 TO 1000:PRINT FM
1640 FOR FN=1 TO 1000:PRINT FN
1650 FOR FO=1 TO 1000:PRINT FO
1660 FOR FP=1 TO 1000:PRINT FP
1670 FOR FQ=1 TO 1000:PRINT FQ
1680 FOR FR=1 TO 1000:PRINT FR
1690 FOR FS=1 TO 1000:PRINT FS
1700 FOR FT=1 TO 1000:PRINT FT
1710 FOR FU=1 TO 1000:PRINT FU
1720 FOR FV=1 TO 1000:PRINT FV
1730 FOR FW=1 TO 1000:PRINT FW
1740 FOR FX=1 TO 1000:PRINT FX
1750 FOR FY=1 TO 1000:PRINT FY
1760 FOR FZ=1 TO 1000:PRINT FZ
1770 FOR GA=1 TO 1000:PRINT GA
1780 FOR GB=1 TO 1000:PRINT GB
1790 FOR GC=1 TO 1000:PRINT GC
1800 FOR GD=1 TO 1000:PRINT GD
1810 FOR GE=1 TO 1000:PRINT GE
1820 FOR GF=1 TO 1000:PRINT GF
1830 FOR GG=1 TO 1000:PRINT GG
1840 FOR GH=1 TO 1000:PRINT GH
1850 FOR GI=1 TO 1000:PRINT GI
1860 FOR GJ=1 TO 1000:PRINT GJ
1870 FOR GK=1 TO 1000:PRINT GK
1880 FOR GL=1 TO 1000:PRINT GL
1890 FOR GM=1 TO 1000:PRINT GM
1900 FOR GN=1 TO 1000:PRINT GN
1910 FOR GO=1 TO 1000:PRINT GO
1920 FOR GP=1 TO 1000:PRINT GP
1930 FOR GQ=1 TO 1000:PRINT GQ
1940 FOR GR=1 TO 1000:PRINT GR
1950 FOR GS=1 TO 1000:PRINT GS
1960 FOR GT=1 TO 1000:PRINT GT
1970 FOR GU=1 TO 1000:PRINT GU
1980 FOR GV=1 TO 1000:PRINT GV
1990 FOR GW=1 TO 1000:PRINT GW
2000 FOR GX=1 TO 1000:PRINT GX
2010 FOR GY=1 TO 1000:PRINT GY
2020 FOR GZ=1 TO 1000:PRINT GZ
2030 FOR HA=1 TO 1000:PRINT HA
2040 FOR HB=1 TO 1000:PRINT HB
2050 FOR HC=1 TO 1000:PRINT HC
2060 FOR HD=1 TO 1000:PRINT HD
2070 FOR HE=1 TO 1000:PRINT HE
2080 FOR HF=1 TO 1000:PRINT HF
2090 FOR HG=1 TO 1000:PRINT HG
2100 FOR HH=1 TO 1000:PRINT HH
2110 FOR HI=1 TO 1000:PRINT HI
2120 FOR HJ=1 TO 1000:PRINT HJ
2130 FOR HK=1 TO 1000:PRINT HK
2140 FOR HL=1 TO 1000:PRINT HL
2150 FOR HM=1 TO 1000:PRINT HM
2160 FOR HN=1 TO 1000:PRINT HN
2170 FOR HO=1 TO 1000:PRINT HO
2180 FOR HP=1 TO 1000:PRINT HP
2190 FOR HQ=1 TO 1000:PRINT HQ
2200 FOR HR=1 TO 1000:PRINT HR
2210 FOR HS=1 TO 1000:PRINT HS
2220 FOR HT=1 TO 1000:PRINT HT
2230 FOR HU=1 TO 1000:PRINT HU
2240 FOR HV=1 TO 1000:PRINT HV
2250 FOR HW=1 TO 1000:PRINT HW
2260 FOR HX=1 TO 1000:PRINT HX
2270 FOR HY=1 TO 1000:PRINT HY
2280 FOR HZ=1 TO 1000:PRINT HZ
2290 FOR IA=1 TO 1000:PRINT IA
2300 FOR IB=1 TO 1000:PRINT IB
2310 FOR IC=1 TO 1000:PRINT IC
2320 FOR ID=1 TO 1000:PRINT ID
2330 FOR IE=1 TO 1000:PRINT IE
2340 FOR IF=1 TO 1000:PRINT IF
2350 FOR IG=1 TO 1000:PRINT IG
2360 FOR IH=1 TO 1000:PRINT IH
2370 FOR II=1 TO 1000:PRINT II
2380 FOR IJ=1 TO 1000:PRINT IJ
2390 FOR IK=1 TO 1000:PRINT IK
2400 FOR IL=1 TO 1000:PRINT IL
2410 FOR IM=1 TO 1000:PRINT IM
2420 FOR IN=1 TO 1000:PRINT IN
2430 FOR IO=1 TO 1000:PRINT IO
2440 FOR IP=1 TO 1000:PRINT IP
2450 FOR IQ=1 TO 1000:PRINT IQ
2460 FOR IR=1 TO 1000:PRINT IR
2470 FOR IS=1 TO 1000:PRINT IS
2480 FOR IT=1 TO 1000:PRINT IT
2490 FOR IU=1 TO 1000:PRINT IU
2500 FOR IV=1 TO 1000:PRINT IV
2510 FOR IW=1 TO 1000:PRINT IW
2520 FOR IX=1 TO 1000:PRINT IX
2530 FOR IY=1 TO 1000:PRINT IY
2540 FOR IZ=1 TO 1000:PRINT IZ
2550 FOR JA=1 TO 1000:PRINT JA
2560 FOR JB=1 TO 1000:PRINT JB
2570 FOR JC=1 TO 1000:PRINT JC
2580 FOR JD=1 TO 1000:PRINT JD
2590 FOR JE=1 TO 1000:PRINT JE
2600 FOR JF=1 TO 1000:PRINT JF
2610 FOR JG=1 TO 1000:PRINT JG
2620 FOR JH=1 TO 1000:PRINT JH
2630 FOR JI=1 TO 1000:PRINT JI
2640 FOR JJ=1 TO 1000:PRINT JJ
2650 FOR JK=1 TO 1000:PRINT JK
2660 FOR JL=1 TO 1000:PRINT JL
2670 FOR JM=1 TO 1000:PRINT JM
2680 FOR JN=1 TO 1000:PRINT JN
2690 FOR JO=1 TO 1000:PRINT JO
2700 FOR JP=1 TO 1000:PRINT JP
2710 FOR JQ=1 TO 1000:PRINT JQ
2720 FOR JR=1 TO 1000:PRINT JR
2730 FOR JS=1 TO 1000:PRINT JS
2740 FOR JT=1 TO 1000:PRINT JT
2750 FOR JU=1 TO 1000:PRINT JU
2760 FOR JV=1 TO 1000:PRINT JV
2770 FOR JW=1 TO 1000:PRINT JW
2780 FOR JX=1 TO 1000:PRINT JX
2790 FOR JY=1 TO 1000:PRINT JY
2800 FOR JZ=1 TO 1000:PRINT JZ
2810 FOR KA=1 TO 1000:PRINT KA
2820 FOR KB=1 TO 1000:PRINT KB
2830 FOR KC=1 TO 1000:PRINT KC
2840 FOR KD=1 TO 1000:PRINT KD
2850 FOR KE=1 TO 1000:PRINT KE
2860 FOR KF=1 TO 1000:PRINT KF
2870 FOR KG=1 TO 1000:PRINT KG
2880 FOR KH=1 TO 1000:PRINT KH
2890 FOR KI=1 TO 1000:PRINT KI
2900 FOR KJ=1 TO 1000:PRINT KJ
2910 FOR KK=1 TO 1000:PRINT KK
2920 FOR KL=1 TO 1000:PRINT KL
2930 FOR KM=1 TO 1000:PRINT KM
2940 FOR KN=1 TO 1000:PRINT KN
2950 FOR KO=1 TO 1000:PRINT KO
2960 FOR KP=1 TO 1000:PRINT KP
2970 FOR KQ=1 TO 1000:PRINT KQ
2980 FOR KR=1 TO 1000:PRINT KR
2990 FOR KS=1 TO 1000:PRINT KS
3000 FOR KT=1 TO 1000:PRINT KT
3010 FOR KU=1 TO 1000:PRINT KU
3020 FOR KV=1 TO 1000:PRINT KV
3030 FOR KW=1 TO 1000:PRINT KW
3040 FOR KX=1 TO 1000:PRINT KX
3050 FOR KY=1 TO 1000:PRINT KY
3060 FOR KZ=1 TO 1000:PRINT KZ
3070 FOR LA=1 TO 1000:PRINT LA
3080 FOR LB=1 TO 1000:PRINT LB
3090 FOR LC=1 TO 1000:PRINT LC
3100 FOR LD=1 TO 1000:PRINT LD
3110 FOR LE=1 TO 1000:PRINT LE
3120 FOR LF=1 TO 1000:PRINT LF
3130 FOR LG=1 TO 1000:PRINT LG
3140 FOR LH=1 TO 1000:PRINT LH
3150 FOR LI=1 TO 1000:PRINT LI
3160 FOR LJ=1 TO 1000:PRINT LJ
3170 FOR LK=1 TO 1000:PRINT LK
3180 FOR LL=1 TO 1000:PRINT LL
3190 FOR LM=1 TO 1000:PRINT LM
3200 FOR LN=1 TO 1000:PRINT LN
3210 FOR LO=1 TO 1000:PRINT LO
3220 FOR LP=1 TO 1000:PRINT LP
3230 FOR LQ=1 TO 1000:PRINT LQ
3240 FOR LR=1 TO 1000:PRINT LR
3250 FOR LS=1 TO 1000:PRINT LS
3260 FOR LT=1 TO 1000:PRINT LT
3270 FOR LU=1 TO 1000:PRINT LU
3280 FOR LV=1 TO 1000:PRINT LV
3290 FOR LW=1 TO 1000:PRINT LW
3300 FOR LX=1 TO 1000:PRINT LX
3310 FOR LY=1 TO 1000:PRINT LY
3320 FOR LZ=1 TO 1000:PRINT LZ
3330 FOR MA=1 TO 1000:PRINT MA
3340 FOR MB=1 TO 1000:PRINT MB
3350 FOR MC=1 TO 1000:PRINT MC
3360 FOR MD=1 TO 1000:PRINT MD
3370 FOR ME=1 TO 1000:PRINT ME
3380 FOR MF=1 TO 1000:PRINT MF
3390 FOR MG=1 TO 1000:PRINT MG
3400 FOR MH=1 TO 1000:PRINT MH
3410 FOR MI=1 TO 1000:PRINT MI
3420 FOR MJ=1 TO 1000:PRINT MJ
3430 FOR MK=1 TO 1000:PRINT MK
3440 FOR ML=1 TO 1000:PRINT ML
3450 FOR MM=1 TO 1000:PRINT MM
3460 FOR MN=1 TO 1000:PRINT MN
3470 FOR MO=1 TO 1000:PRINT MO
3480 FOR MP=1 TO 1000:PRINT MP
3490 FOR MQ=1 TO 1000:PRINT MQ
3500 FOR MR=1 TO 1000:PRINT MR
3510 FOR MS=1 TO 1000:PRINT MS
3520 FOR MT=1 TO 1000:PRINT MT
3530 FOR MU=1 TO 1000:PRINT MU
3540 FOR MV=1 TO 1000:PRINT MV
3550 FOR MW=1 TO 1000:PRINT MW
3560 FOR MX=1 TO 1000:PRINT MX
3570 FOR MY=1 TO 1000:PRINT MY
3580 FOR MZ=1 TO 1000:PRINT MZ
3590 FOR NA=1 TO 1000:PRINT NA
3600 FOR NB=1 TO 1000:PRINT NB
3610 FOR NC=1 TO 1000:PRINT NC
3620 FOR ND=1 TO 1000:PRINT ND
3630 FOR NE=1 TO 1000:PRINT NE
3640 FOR NF=1 TO 1000:PRINT NF
3650 FOR NG=1 TO 1000:PRINT NG
3660 FOR NH=1 TO 1000:PRINT NH
3670 FOR NI=1 TO 1000:PRINT NI
3680 FOR NJ=1 TO 1000:PRINT NJ
3690 FOR NK=1 TO 1000:PRINT NK
3700 FOR NL=1 TO 1000:PRINT NL
3710 FOR NM=1 TO 1000:PRINT NM
3720 FOR NN=1 TO 1000:PRINT NN
3730 FOR NO=1 TO 1000:PRINT NO
3740 FOR NP=1 TO 1000:PRINT NP
3750 FOR NQ=1 TO 1000:PRINT NQ
3760 FOR NR=1 TO 1000:PRINT NR
3770 FOR NS=1 TO 1000:PRINT NS
3780 FOR NT=1 TO 1000:PRINT NT
3790 FOR NU=1 TO 1000:PRINT NU
3800 FOR NV=1 TO 1000:PRINT NV
3810 FOR NW=1 TO 1000:PRINT NW
3820 FOR NX=1 TO 1000:PRINT NX
3830 FOR NY=1 TO 1000:PRINT NY
3840 FOR NZ=1 TO 1000:PRINT NZ
3850 FOR OA=1 TO 1000:PRINT OA
3860 FOR OB=1 TO 1000:PRINT OB
3870 FOR OC=1 TO 1000:PRINT OC
3880 FOR OD=1 TO 1000:PRINT OD
3890 FOR OE=1 TO 1000:PRINT OE
3900 FOR OF=1 TO 1000:PRINT OF
3910 FOR OG=1 TO 1000:PRINT OG
3920 FOR OH=1 TO 1000:PRINT OH
3930 FOR OI=1 TO 1000:PRINT OI
3940 FOR OJ=1 TO 1000:PRINT OJ
3950 FOR OK=1 TO 1000:PRINT OK
3960 FOR OL=1 TO 1000:PRINT OL
3970 FOR OM=1 TO 1000:PRINT OM
3980 FOR ON=1 TO 1000:PRINT ON
3990 FOR OO=1 TO 1000:PRINT OO
4000 FOR OP=1 TO 1000:PRINT OP
4010 FOR OQ=1 TO 1000:PRINT OQ
4020 FOR OR=1 TO 1000:PRINT OR
4030 FOR OS=1 TO 1000:PRINT OS
4040 FOR OT=1 TO 1000:PRINT OT
4050 FOR OU=1 TO 1000:PRINT OU
4060 FOR OV=1 TO 1000:PRINT OV
4070 FOR OW=1 TO 1000:PRINT OW
4080 FOR OX=1 TO 1000:PRINT OX
4090 FOR OY=1 TO 1000:PRINT OY
4100 FOR OZ=1 TO 1000:PRINT OZ
4110 FOR PA=1 TO 1000:PRINT PA
4120 FOR PB=1 TO 1000:PRINT PB
4130 FOR PC=1 TO 1000:PRINT PC
4140 FOR PD=1 TO 1000:PRINT PD
4150 FOR PE=1 TO 1000:PRINT PE
4160 FOR PF=1 TO 1000:PRINT PF
4170 FOR PG=1 TO 1000:PRINT PG
4180 FOR PH=1 TO 1000:PRINT PH
4190 FOR PI=1 TO 1000:PRINT PI
4200 FOR PJ=1 TO 1000:PRINT PJ
4210 FOR PK=1 TO 1000:PRINT PK
4220 FOR PL=1 TO 1000:PRINT PL
4230 FOR PM=1 TO 1000:PRINT PM
4240 FOR PN=1 TO 1000:PRINT PN
4250 FOR PO=1 TO 1000:PRINT PO
4260 FOR PP=1 TO 1000:PRINT PP
4270 FOR PQ=1 TO 1000:PRINT PQ
4280 FOR PR=1 TO 1000:PRINT PR
4290 FOR PS=1 TO 1000:PRINT PS
4300 FOR PT=1 TO 1000:PRINT PT
4310 FOR PU=1 TO 1000:PRINT PU
4320 FOR PV=1 TO 1000:PRINT PV
4330 FOR PW=1 TO 1000:PRINT PW
4340 FOR PX=1 TO 1000:PRINT PX
4350 FOR PY=1 TO 1000:PRINT PY
4360 FOR PZ=1 TO 1000:PRINT PZ
4370 FOR QA=1 TO 1000:PRINT QA
4380 FOR QB=1 TO 1000:PRINT QB
4390 FOR QC=1 TO 1000:PRINT QC
4400 FOR QD=1 TO 1000:PRINT QD
4410 FOR QE=1 TO 1000:PRINT QE
4420 FOR QF=1 TO 1000:PRINT QF
4430 FOR QG=1 TO 1000:PRINT QG
4440 FOR QH=1 TO 1000:PRINT QH
4450 FOR QI=1 TO 1000:PRINT QI
4460 FOR QJ=1 TO 1000:PRINT QJ
4470 FOR QK=1 TO 1000:PRINT QK
4480 FOR QL=1 TO 1000:PRINT QL
4490 FOR QM=1 TO 1000:PRINT QM
4500 FOR QN=1 TO 1000:PRINT QN
4510 FOR QO=1 TO 1000:PRINT QO
4520 FOR QP=1 TO 1000:PRINT QP
4530 FOR QQ=1 TO 1000:PRINT QQ
4540 FOR QR=1 TO 1000:PRINT QR
4550 FOR QS=1 TO 1000:PRINT QS
4560 FOR QT=1 TO 1000:PRINT QT
4570 FOR QU=1 TO 1000:PRINT QU
4580 FOR QV=1 TO 1000:PRINT QV
4590 FOR QW=1 TO 1000:PRINT QW
4600 FOR QX=1 TO 1000:PRINT QX
4610 FOR QY=1 TO 1000:PRINT QY
4620 FOR QZ=1 TO 1000:PRINT QZ
4630 FOR RA=1 TO 1000:PRINT RA
4640 FOR RB=1 TO 1000:PRINT RB
4650 FOR RC=1 TO 1000:PRINT RC
4660 FOR RD=1 TO 1000:PRINT RD
4670 FOR RE=1 TO 1000:PRINT RE
4680 FOR RF=1 TO 1000:PRINT RF
4690 FOR RG=1 TO 1000:PRINT RG
4700 FOR RH=1 TO 1000:PRINT RH
4710 FOR RI=1 TO 1000:PRINT RI
4720 FOR RJ=1 TO 1000:PRINT RJ
4730 FOR RK=1 TO 1000:PRINT RK
4740 FOR RL=1 TO 1000:PRINT RL
4750 FOR RM=1 TO 1000:PRINT RM
4760 FOR RN=1 TO 1000:PRINT RN
4770 FOR RO=1 TO 1000:PRINT RO
4780 FOR RP=1 TO 1000:PRINT RP
4790 FOR RQ=1 TO 1000:PRINT RQ
4800 FOR RR=1 TO 1000:PRINT RR
4810 FOR RS=1 TO 1000:PRINT RS
4820 FOR RT=1 TO 1000:PRINT RT
4830 FOR RU=1 TO 1000:PRINT RU
4840 FOR RV=1 TO 1000:PRINT RV
4850 FOR RW=1 TO 1000:PRINT RW
4860 FOR RX=1 TO 1000:PRINT RX
4870 FOR RY=1 TO 1000:PRINT RY
4880 FOR RZ=1 TO 1000:PRINT RZ
4890 FOR SA=1 TO 1000:PRINT SA
4900 FOR SB=1 TO 1000:PRINT SB
4910 FOR SC=1 TO 1000:PRINT SC
4920 FOR SD=1 TO 1000:PRINT SD
4930 FOR SE=1 TO 1000:PRINT SE
4940 FOR SF=1 TO 1000:PRINT SF
4950 FOR SG=1 TO 1000:PRINT SG
4960 FOR SH=1 TO 1000:PRINT SH
4970 FOR SI=1 TO 1000:PRINT SI
4980 FOR SJ=1 TO 1000:PRINT SJ
4990 FOR SK=1 TO 1000:PRINT SK
5000 FOR SL=1 TO 1000:PRINT SL
5010 FOR SM=1 TO 1000:PRINT SM
5020 FOR SN=1 TO 1000:PRINT SN
5030 FOR SO=1 TO 1000:PRINT SO
5040 FOR SP=1 TO 1000:PRINT SP
5050 FOR SQ=1 TO 1000:PRINT SQ
5060 FOR SR=1 TO 1000:PRINT SR
5070 FOR SS=1 TO 1000:PRINT SS
5080 FOR ST=1 TO 1000:PRINT ST
5090 FOR SU=1 TO 1000:PRINT SU
5100 FOR SV=1 TO 1000:PRINT SV
5110 FOR SW=1 TO 1000:PRINT SW
5120 FOR SX=1 TO 1000:PRINT SX
5130 FOR SY=1 TO 1000:PRINT SY
5140 FOR SZ=1 TO 1000:PRINT SZ
5150 FOR TA=1 TO 1000:PRINT TA
5160 FOR TB=1 TO 1000:PRINT TB
5170 FOR TC=1 TO 1000:PRINT TC
5180 FOR TD=1 TO 1000:PRINT TD
5190 FOR TE=1 TO 1000:PRINT TE
5200 FOR TF=1 TO 1000:PRINT TF
5210 FOR TG=1 TO 1000:PRINT TG
5220 FOR TH=1 TO 1000:PRINT TH
5230 FOR TI=1 TO 1000:PRINT TI
5240 FOR TJ=1 TO 1000:PRINT TJ
5250 FOR TK=1 TO 1000:PRINT TK
5260 FOR TL=1 TO 1000:PRINT TL
5270 FOR TM=1 TO 1000:PRINT TM
5280 FOR TN=1 TO 1000:PRINT TN
5290 FOR TO=1 TO 1000:PRINT TO
5300 FOR TP=1 TO 1000:PRINT TP
5310 FOR TQ=1 TO 1000:PRINT TQ
5320 FOR TR=1 TO 1000:PRINT TR
5330 FOR TS=1 TO 1000:PRINT TS
5340 FOR TT=1 TO 1000:PRINT TT
5350 FOR TU=1 TO 1000:PRINT TU
5360 FOR TV=1 TO 1000:PRINT TV
5370 FOR TW=1 TO 1000:PRINT TW
5380 FOR TX=1 TO 1000:PRINT TX
5390 FOR TY=1 TO 1000:PRINT TY
5400 FOR TZ=1 TO 1000:PRINT TZ
5410 FOR UA=1 TO 1000:PRINT UA
5420 FOR UB=1 TO 1000:PRINT UB
5430 FOR UC=1 TO 1000:PRINT UC
5440 FOR UD=1 TO 1000:PRINT UD
5450 FOR UE=1 TO 1000:PRINT UE
5460 FOR UF=1 TO 1000:PRINT UF
5470 FOR UG=1 TO 1000:PRINT UG
5480 FOR UH=1 TO 1000:PRINT UH
5490 FOR UI=1 TO 1000:PRINT UI
5500 FOR UJ=1 TO 1000:PRINT UJ
5510 FOR UK=1 TO 1000:PRINT UK
5520 FOR UL=1 TO 1000:PRINT UL
5530 FOR UM=1 TO 1000:PRINT UM
5540 FOR UN=1 TO 1000:PRINT UN
5550 FOR UO=1 TO 1000:PRINT UO
5560 FOR UP=1 TO 1000:PRINT UP
5570 FOR UQ=1 TO 1000:PRINT UQ
5580 FOR UR=1 TO 1000:PRINT UR
5590 FOR US=1 TO 1000:PRINT US
5600 FOR UT=1 TO 1000:PRINT UT
5
```

# Micro Scope

MANDALA is an elementary but very effective program that draws a pattern on the screen.

The program itself is very simple, with only 10 active lines. But the logic behind it isn't trivial.

Try working it out with pencil and paper and you'll soon see the pattern emerging.

No. 4  
Mandala

```
10 REM MANDALA
20 GRAPHICS 8+16
30 COLOR 1:PL0T 150,70
40 FOR N=0 TO 100 STEP INT(RND(8)*10+1)
50 GOTO 150,150-X
60 GOTO 150-X,100
70 GOTO 150,X
80 GOTO 150*X,100
90 NEXT X
100 FOR DELAY=1 TO 750:NEXT DELAY
110 RUN
```

- 10 A REM containing the program name.  
20 Selects full-screen Graphics 8 mode.  
30 Selects colour and plots the starting point.  
40-90 These lines define a FOR...NEXT loop which draws the pattern. Each time round the loop four lines are drawn. The changing value of X changes the positions

of the lines. The step size is chosen randomly within the range 1-10 so that variations in the pattern density are produced.

- 100 Delay to keep the display on the screen long enough to be seen.  
110 Start again.

# 68000 POWER TO THE PROGRAMMER

**THE 8 bit microprocessors have been around for over 10 years now. While there have been many improvements in hardware in that time the philosophy of processor design has served quite well.**

Now that it is possible to get even more circuitry on to a chip, a new breed of 16 and 32 bit microprocessors are emerging which have power that is not so "micro".

Most manufacturers of the new generation of processors were involved with the earlier 8 bit ones, and

Processor" and is the approach taken by Motorola in designing the 68000 microprocessor.

While the other approaches have been tried with some success measured in sales, it is rumoured that most programmers working on these other processors have a 68000 as a pinup fantasy on their office walls.

The secret of this lies in the instruction set, the basic commands that all other commands must be made from.

In a word, it is very "orthogonal",

programming is as sweet as a dream.

Let's see exactly what the instructions are which make it such a joy to use.

Of course I cannot hope to do justice to this in a short article, but I hope to be able to give you the flavour of what's available.

Next month we will look at the addressing modes and finally at the hardware structure.

Firstly, the way the memory is organised is in bytes.

Each byte has an address, but, as

**MIKE COOK looks at the new breed of microprocessors whose power, he reveals, is anything but "micro"**

it is interesting to see how they viewed their development.

One approach is to keep things as similar as possible.

This has the advantage of not requiring vastly new skills, but tends to "freeze in" all the design errors and compromises that were made in the past.

Another approach is to bolt on increasingly more powerful commands giving large raw processing power.

This approach produces very powerful processors that do well in bench mark tests but are rather difficult to bend to your particular application.

In other words, a racing car rather like a dragster, unbeatable in acceleration but a swine on the corners!

The final approach is to look at the code that was written on the 8 bit processors and analyse it for sequences.

Which means, find out what the programmer wants to do and then design a processor that will make it easier for him to do it.

This produces a "Programmer's

which means that you don't have to worry about what commands you can perform with what registers on what memory locations.

If you want to do an operation the odds are that there is an instruction/addressing mode combination to do it.

This will be worked out for you by a good assembler - all you have to do is specify the source and destination of the operation.

While it is possible, and in most cases desirable, to program 8 bit processors in hex, looking up the code for each instruction, this would soon drive you up the wall with the 68000.

There are so many different combinations of addressing mode and instructions that you have to "construct" a machine code instruction from the bit patterns which specify the source and destination locations.

So, in practice it would take you at least 30 seconds to work out each instruction.

Obviously this soon mounts up and becomes totally unacceptable. But with an assembler, however, pro-

the data bus is 16 bits wide, the least significant address line is not brought out.

So data is fetched two bytes at a time, known as a word.

All of the internal registers are 32 bits long, which takes four byte addresses or two word locations to store them.

Consequently a 32 bit quantity is referred to as a "long word".

So most instructions can be performed on a byte, a word or a long word.

To simplify matters, all word operations must be performed on even byte addresses.

So, for example, if you want to store a word at address location 4, the most significant byte goes in location 4 and the least significant byte goes in location 5.

This is what I consider to be the right way round as we write the most significant part of a number first. But notice that this is the reverse of the way the 6502 handles numbers.

Now let's look at what registers we

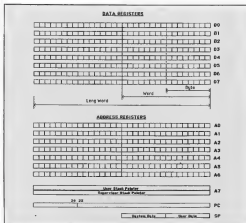


Figure 1: The 68000 Registers

have in the 68000. These are shown in Figure 1.

As you can see, there are quite a lot of them. The two main types are the Data and Address registers and all of these are 32 bits long.

In general, data registers can be very freely manipulated, and most instructions will operate on them.

Address registers, on the other hand, are mainly used to determine what memory address to use.

Address register 7 (A7) is used as the stack pointer, but any other address register can be so used.

All the subroutine return addresses use the A7 register as their stack pointer, so you can have separate data and return stacks.

This is very useful when implementing high-level languages such as Pascal and Fort.

You may have noticed that register A7 appears to be two registers and so it is.

The 68000 can run in two modes—supervisor and user modes. This means that your operating system can run in the supervisor mode and your application in the user mode.

This makes trace operations easier as well as error handling.

Each mode also has a separate status register.

There is also a program counter. In most microprocessors this is normally the largest register, but paradoxically here it is one of the smallest.

Only the lower three bytes are brought out, thus limiting the memory to 24 mbytes.

In future versions of the chip these extra locations might be brought out, but there is more than enough memory space for the time being.

The most common instructions used in any program are loading and storing of registers. In the 68000 these have been simplified to a single MOVE command.

The source and destination can be quite freely specified to give you exactly the effect you want.

You can even move data between memory locations without passing through any of the registers.

There is even a "move multiple registers" instruction which allows any number of registers to be quickly saved or restored from memory.

Regarding program structure, there are plenty of conditional branch instructions.

There is also an instruction which

decrements a register and branches if the register has not yet reached zero. I wish I had a pint for every time I have used that combination!

There are the usual collection of logic operations including shifts.

However, a single instruction can specify any number of shifts to left or right.

The big plus of this class of instructions are the multiply and divide instructions.

When using the multiply instruction, only 16 bits of the registers can be used because the result of two 16 bit operations is a 32 bit value.

There are also instructions which allow the operations to be signed or unsigned.

Another class of instructions are the Trap instructions. These are like a single instruction call-to-subroutine.

When they are used, the program goes to an address stored in a fixed memory location, and these locations are known as the Trap vectors.

They are very handy for communicating with the operating system in a standard way.

If all input and output is done through these traps, then programs written for one hardware configuration of the 68000 can easily be modified to run on another.

This is very much the way the CP/M operating system works.

These instructions also allow the expansion of the instruction set by providing an easy way to call Macro commands—the Apple Macintosh makes extensive use of these.

Perhaps the newest of instructions are the Link and Unlink. These are capable of implementing a frame pointer to allow an area of memory to be dynamically allocated and deallocated.

You can use them to store local variables in procedures and to return values when the procedures are finished.

This is vital when procedures are being called recursively.

This feature makes the implementation of Pascal especially easy.

With all these instructions at your command, the task of programming is made very much easier than on any 8 bit processor.

● Next month we will see how these powerful instructions combine with a multitude of addressing modes to produce a very versatile instruction set.



# ARE YOU A FRUITI GAMBLER?

IF you're one of those people who spend a fortune on the fruit machine in your local, here's a program from CLIVE PALMER to save you money.

Fruiti Gambler is a fruit machine simulation complete with Hold and Nudge features and incorporating a special Gamble feature reel.

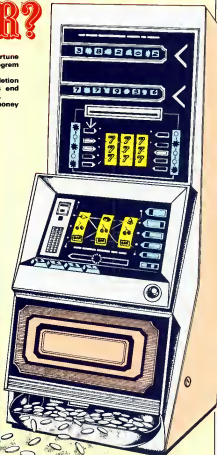
While you're typing it in, think of the money you'll save.

## PROGRAM STRUCTURE

50-70	GOTO initialise routine.
90-130	Main program loop.
150-260	Print a reel routine.
280-390	Spin reels 1-3 T1 times.
410-560	Nudge routine.
680-900	Test for a win: No Win - Return. :Win - Gamble?.
910-920	Clear message screen.
930-980	How much is left in bank?
970	Decrement position in reels by 1.
980	Increment position in reels by 1. (used by WIN routine.)
990	Turn all sound channels off.
1010-1070	Start.
1090-1220	Hold reel routine.
1240-1600	Set up new character set.
1510-1710	Define/initialise main variables.
1730-1860	Draw screen display.
1880-2120	Initialise display list interrupt.
2140-2190	Re-start/finish routine.
2200-2310	Gamble routine.

## MAJOR VARIABLES

FRUIT\$(64)	Contains all fruits for reels.
X(4) & Y(4)	Position of reels.
POS(4)	Pointer showing where we are in reel.
H\$(3)	Used to determine if a reel is HELD.
REEL(4,32)	Used to hold reel/fruit data.
WIN(11)	Winning amounts for a winning line.
CASH\$(12)	Used to change cash into inverse before displaying on the screen.
CASH	How much you have.
PAY	How much you won.



[illegible][illegible][illegible]

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1270 DATA 140,1,1,1,1,2,12,240,0
1280 DATA 109,0,0,0,0,0,0,0,0,100,2,7,
30,31,32,62,127,220,111,0,1,3,35,31,12
7,255,252
1290 DATA 112,234,252,262,240,240,224,
270,0
1300 DATA 112,0,0,0,0,1,31,62,127,114,
12,6,110,252,262,254,254,254,255,252,2
55,255,250,255,127,127,31
1310 DATA 110,252,240,240,240,240,240,
224,120
1320 DATA 117,24,70,12,3,62,102,75,207
,110,40,112,254,120,100,254,254,255,12
7,231,255,255,255,255,127,127,31
1330 DATA 120,255,250,255,250,250,254,
254,240
1340 DATA 70,0,1,7,12,24,34,24,62,71,0
,240,240,0,0,0,120,72,62,36,24,24,24
,127,127,0,7,120,0,0,0,0,240,240,0
1350 DATA 3,0,12,14,0,1,1,2,4,0,24,2
7,40,154,240,132,32,0,0,20,54,111,117
,62,20,0
1360 DATA 0,0,20,62,127,127,62,20,0
1370 DATA 121,0,0,7,20,62,62,127,127,1
22,0,254,102,62,255,250,255,255,11,117
,255,255,250,250,127,0
1380 DATA 12,255,254,254,252,240,124,1
24,0
1390 DATA 27,0,255,255,0,32,30,20,24,2
6,0,250,250,0,120,64,42,20,24,24,24
,112,0,255,250,0
1400 DATA 22,42,44,72,120,0,255,250,0
1410 DATA 74,0,154,162,232,107,109,104
,0,75,0,70,62,62,62,62,120,0,7,0,0,0
,0,0,61,61,77,0,0,120,170,224
1420 DATA 240,240,232,70,62,62,0,0,0,0
,0,6,75,252,240,240,224,120,120,0,0
1430 DATA 60,0,0,1,2,7,12,31,62,62,0,0
,0,0,0,0,202,252,04,62,31,25,7,3,1,0,0
,00,252,252,0,0,0,0,0,0
1440 DATA 05,255,255,255,250,0,0,0,0
1450 DATA 59,0,1,0,20,61,127,110,127,6
,0,70,120,240,100,254,220,254,01,125
,111,115,54,31,11,7,3
1460 DATA 62,110,250,102,220,240,112,2
24,120
1470 DATA 65,0,255,255,0,0,100,104,104
,00,0,250,250,0,0,102,122,100,07,140,1
40,250,0,0,255,255,0
1480 DATA 00,20,20,231,0,0,255,250,0
1490 DATA 20,0,250,250,6,0,75,54,20,7,0
,0,75,250,0,0,40,100,12,00,20,54,25,0
,0,255,255,0,20,24,40,104,0,255,255,0
1500 DATA 122,24,100,70,120,70,56,252,
0
1510 DIM PRG1(54),@0(0),V(0),P(0-40),0
5(0),DEL(1,2,3),N(0-11),C(0-0-0-0)
1520 REM ***** DATA *****
1530 DATA 10,7,0,5,2,1,0,4,2,6,10,1,2,
6,5,6,7,1,4,0,10,7,9,6,0,0,7,1,4,10,
7
1540 DATA 0,0,4,2,10,1,11,7,3,5,3,10,7
,1,0,7,11,6,9,4,2,0,10,11,0,1,3,7,4,0,
0,0
1550 DATA 2,0,10,0,1,3,7,5,4,3,10,0,1,
7,0,2,0,2,0,1,10,2,4,7,5,3,1,6,7,2,0
1560 DATA 12,13,11,14,12,15,12,16,12,1
5,12,14,12,16,12,18,12,15,12,14,12,15
,12,16,12,13,14,12,16,12,12
1570 REM ***** DATA *****

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1580 DATA 00,200,150,70,40,50,100,30,4
0,0,10
1590 FOR I=0 TO 0:P(0)=0:INT(1000*I/0)0
1600 FOR I=0 TO 32:0=0 2:DEL(I),V(2)=0
END TO NEXT 0
1610 FOR I=0 TO 11:0=0 2:DEL(I)=2:DEL(
0
1620 PRINT "*****data file*****prg1/
\del(1)del(2)del(3)del(4)del(5)del(6)del(7)del(8)
del(9)del(10)del(11)del(12)del(13)del(14)del(15)del(16)del(17)del(18)del(19)del(20)del(21)del(22)del(23)del(24)del(25)del(26)del(27)del(28)del(29)del(30)del(31)del(32)del(33)del(34)del(35)del(36)del(37)del(38)del(39)del(40)del(41)del(42)del(43)del(44)del(45)del(46)del(47)del(48)del(49)del(50)del(51)del(52)del(53)del(54)del(55)del(56)del(57)del(58)del(59)del(60)del(61)del(62)del(63)del(64)del(65)del(66)del(67)del(68)del(69)del(70)del(71)del(72)del(73)del(74)del(75)del(76)del(77)del(78)del(79)del(80)del(81)del(82)del(83)del(84)del(85)del(86)del(87)del(88)del(89)del(90)del(91)del(92)del(93)del(94)del(95)del(96)del(97)del(98)del(99)del(100)del(101)del(102)del(103)del(104)del(105)del(106)del(107)del(108)del(109)del(110)del(111)del(112)del(113)del(114)del(115)del(116)del(117)del(118)del(119)del(120)del(121)del(122)del(123)del(124)del(125)del(126)del(127)del(128)del(129)del(130)del(131)del(132)del(133)del(134)del(135)del(136)del(137)del(138)del(139)del(140)del(141)del(142)del(143)del(144)del(145)del(146)del(147)del(148)del(149)del(150)del(151)del(152)del(153)del(154)del(155)del(156)del(157)del(158)del(159)del(160)del(161)del(162)del(163)del(164)del(165)del(166)del(167)del(168)del(169)del(170)del(171)del(172)del(173)del(174)del(175)del(176)del(177)del(178)del(179)del(180)del(181)del(182)del(183)del(184)del(185)del(186)del(187)del(188)del(189)del(190)del(191)del(192)del(193)del(194)del(195)del(196)del(197)del(198)del(199)del(200)del(201)del(202)del(203)del(204)del(205)del(206)del(207)del(208)del(209)del(210)del(211)del(212)del(213)del(214)del(215)del(216)del(217)del(218)del(219)del(220)del(221)del(222)del(223)del(224)del(225)del(226)del(227)del(228)del(229)del(230)del(231)del(232)del(233)del(234)del(235)del(236)del(237)del(238)del(239)del(240)del(241)del(242)del(243)del(244)del(245)del(246)del(247)del(248)del(249)del(250)del(251)del(252)del(253)del(254)del(255)del(256)del(257)del(258)del(259)del(260)del(261)del(262)del(263)del(264)del(265)del(266)del(267)del(268)del(269)del(270)del(271)del(272)del(273)del(274)del(275)del(276)del(277)del(278)del(279)del(280)del(281)del(282)del(283)del(284)del(285)del(286)del(287)del(288)del(289)del(290)del(291)del(292)del(293)del(294)del(295)del(296)del(297)del(298)del(299)del(300)del(301)del(302)del(303)del(304)del(305)del(306)del(307)del(308)del(309)del(310)del(311)del(312)del(313)del(314)del(315)del(316)del(317)del(318)del(319)del(320)del(321)del(322)del(323)del(324)del(325)del(326)del(327)del(328)del(329)del(330)del(331)del(332)del(333)del(334)del(335)del(336)del(337)del(338)del(339)del(340)del(341)del(342)del(343)del(344)del(345)del(346)del(347)del(348)del(349)del(350)del(351)del(352)del(353)del(354)del(355)del(356)del(357)del(358)del(359)del(360)del(361)del(362)del(363)del(364)del(365)del(366)del(367)del(368)del(369)del(370)del(371)del(372)del(373)del(374)del(375)del(376)del(377)del(378)del(379)del(380)del(381)del(382)del(383)del(384)del(385)del(386)del(387)del(388)del(389)del(390)del(391)del(392)del(393)del(394)del(395)del(396)del(397)del(398)del(399)del(400)del(401)del(402)del(403)del(404)del(405)del(406)del(407)del(408)del(409)del(410)del(411)del(412)del(413)del(414)del(415)del(416)del(417)del(418)del(419)del(420)del(421)del(422)del(423)del(424)del(425)del(426)del(427)del(428)del(429)del(430)del(431)del(432)del(433)del(434)del(435)del(436)del(437)del(438)del(439)del(440)del(441)del(442)del(443)del(444)del(445)del(446)del(447)del(448)del(449)del(450)del(451)del(452)del(453)del(454)del(455)del(456)del(457)del(458)del(459)del(460)del(461)del(462)del(463)del(464)del(465)del(466)del(467)del(468)del(469)del(470)del(471)del(472)del(473)del(474)del(475)del(476)del(477)del(478)del(479)del(480)del(481)del(482)del(483)del(484)del(485)del(486)del(487)del(488)del(489)del(490)del(491)del(492)del(493)del(494)del(495)del(496)del(497)del(498)del(499)del(500)del(501)del(502)del(503)del(504)del(505)del(506)del(507)del(508)del(509)del(510)del(511)del(512)del(513)del(514)del(515)del(516)del(517)del(518)del(519)del(520)del(521)del(522)del(523)del(524)del(525)del(526)del(527)del(528)del(529)del(530)del(531)del(532)del(533)del(534)del(535)del(536)del(537)del(538)del(539)del(540)del(541)del(542)del(543)del(544)del(545)del(546)del(547)del(548)del(549)del(550)del(551)del(552)del(553)del(554)del(555)del(556)del(557)del(558)del(559)del(560)del(561)del(562)del(563)del(564)del(565)del(566)del(567)del(568)del(569)del(570)del(571)del(572)del(573)del(574)del(575)del(576)del(577)del(578)del(579)del(580)del(581)del(582)del(583)del(584)del(585)del(586)del(587)del(588)del(589)del(590)del(591)del(592)del(593)del(594)del(595)del(596)del(597)del(598)del(599)del(600)del(601)del(602)del(603)del(604)del(605)del(606)del(607)del(608)del(609)del(610)del(611)del(612)del(613)del(614)del(615)del(616)del(617)del(618)del(619)del(620)del(621)del(622)del(623)del(624)del(625)del(626)del(627)del(628)del(629)del(630)del(631)del(632)del(633)del(634)del(635)del(636)del(637)del(638)del(639)del(640)del(641)del(642)del(643)del(644)del(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ONE of the first major problems to face the unwary adventurer when he takes his first tentative steps in an alternative world is that although the game itself communicates his surroundings in perfect English, on entering his first command the machine seems incapable of understanding it.

Suppose you find yourself "in a large room, with a door to the west. A book lies open on the table". This is a hypothetical example of how an adventure may begin, and yet depending on the sentence analyser – or parser to the more technical – the responses to instructions given by the player may seem totally incomprehensible.

Let's assume we are dealing with an inquisitive novice adventurer. "Read the book", he types. "I don't understand", says the screen – or something equally helpful such as "Eh...".

Rule one, Mr Novice, is that most adventures will not understand full sentences, but work on the trusty verb/noun principle. Hence READ BOOK will produce the required response, while READ THE BOOK or anything more elaborate will get the computer's equivalent of a puzzled stare.

So lesson one absorbed, Novice tries again. READ BOOK. "You don't have it". This is getting ridiculous thinks Novice, and hurls the cassette case at the cat.

Rule two, as Novice has just discovered, is that usually to do something with an object found in the game it has to be something you possess. Simply being in the same room isn't enough, even if, as in this case, it ought to be.

Remembering all he has learnt so far Novice tries again. GET BOOK. "O.K. You have it". READ BOOK.

At this point Novice will doubtless receive some vital information about his mission, or possibly a crude plug for another game, maybe a bed joke or perhaps a small clue. Anyway, it is at least a glimmer of progress, and the adventure can continue.

Seeing as there is nothing more of interest for our intrepid hero, Novice decides to leave the room. Easier said than done. GO WEST. "I can't go in

# Learn how to talk to your micro

says Brillig

that direction". WEST. "I can't go in that direction".

Novice reads the text again, which clearly states there is a door to the west. He is just about to learn Rule 3. Frequently games abbreviate movement to the compass points, usually N, S, E and W, although occasionally also the NW, NE, SE and SW come into play.

This does not necessarily mean that the game will recognise the full word. W, types Novice, and off he goes into another room, with exits North and East.

I think by now that you get the general idea, so that we can leave Novice to stumble around and explore by himself for a while.

The whole point is that to progress in adventures you need to try and understand exactly what the computer is doing to analyse your input.

Once you understand that then you begin to see how you can avoid spending half your adventure reading the same boring "I don't understand" messages.

What the computer does is store each chunk of your input and compare it with a list of words that it is programmed to understand.

In a simple verb/noun input analyser, the first chunk will be compared to a list of verbs, and if the computer has that verb the program will branch off to check the noun.

In the example above, the computer checked through a list of verbs and found READ. After that it repeated the process with BOOK in

the list of nouns. Simple, huh?

So now you can see why Novice had this first problem. The computer analysed his input as READ THE. A quick check through the list reveals no such noun as THE, and the computer sends its message.

In some games such as The Pay-Off, the message will tell you where you are going wrong – "You can't READ a THE".

However in many adventures the same error message is repeated time and time again with no clue as to the problem.

It gets more complicated than that though. In a bid to save memory, and therefore add more to the game, the input analyser will tend to only recognise the first three or four letters of each word.

This means that GET BRON-TOSAURUS is exactly the same as GET BRON. So you don't always need to type out great long words to be understood.

And now we start to see how these new complicated analysers work. What they actually do is to ignore most of what you type, noting your action, what you are doing it to, and whether it involves some form of modifier, such as LOOK BEHIND THE DESK.

To my mind therefore, the use of full sentence analysis merely allows the player to type in a more normal, real life instruction, with little or no effect on the likely response, but more opportunity for a typing error.

It does allow the player to input a

string of commands, to be actioned in sequence, which allows a player to move rapidly through sections of the game already completed and that must be a help.

But aside from that, the temptation to type GET BOOK rather than PICK UP THE DUSTY RED BOOK FROM THE TOP SHELF, gets me every time.

Now I note from the letters page that at least one person is having a bit of trouble with Lords of Time from our old friends Level 9.

No surprises there, as this is another huge game set across nine time zones, with a vital artefact to collect from each zone.

Without further details of where you get stuck I'm afraid Brillig's help can only be guesswork, so if you do have a problem please give me an idea of what you have already covered.

A map would be of assistance as well. And if you have any completed adventure maps send them in - you could help save someone's sanity.

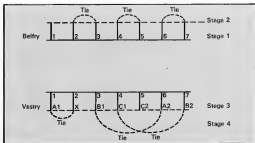
Just in case the problem in Lords of Time is getting started, don't forget that a clock sometimes stops and needs a helping hand. Also Level 9 use a slightly different interpretation of IN than most of us. It won't tell you what you are carrying, but may move you in mysterious ways.

Speaking of Level 9, I mentioned last month that the interpreter they use gives out the occasional glitch. So I have decided to begin a "Glitch of the Month" competition, with an Atari User T shirt as the prize.

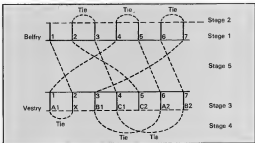
Send your favourite glitch to Atari User, together with your size, and every month I'll announce a winner.

This month, as the contest has only just started, the winner is me, and as we have just looked briefly at Lords of Time, try typing in "Get All" and then try to puzzle out what you would need an Allosaurus for. Sorry boys it may seem like victimisation but anyone who uses "Arle battle gloop" as an error message is really asking for all they get.

One last piece of news. Scott Adams' Questprobe 3 . . . The Fantastic Four was due out in July. I'll take a serious look at the series to date next month.



## Unravelling that tangle in the belfry



IN last month's problem we left you with some bell ropes to sort out after Quasimodo had left them in a tangle.

The solution is as follows - and you would be well advised to make a map:

1. In the belfry, number the ropes 1-7.
2. Tie 2-3, 4-5, and 6-7.
3. Go down to the vestry, number the ropes 1-7, then pull any rope. If another rope goes up mark the pairs A1-A2, B1-B2 and so on. If nothing happens, that rope must be number 1, identify it with an X.
4. Tie X-A1, A2-B1, and B2-C1.

5. Return to the belfry and pull rope 1. The rope that moves down is A1 so you can mark that and A2 (you tied them together in step 2).
6. Pull A2 to identify B1 and B2 and so on.
7. Go down, at which point the program says "Quasimodo ties the 7 ropes to the 7 bells".
8. Pull the ropes in the order that will ring them 1-7. Our particular solution was 2,5,4,1,6,7,3 but yours could be different due to the random element.

## Drop a brick and solve a problem

AN essential element, indeed almost a definition, of an adventure is that the player moves around, picking up and dropping objects until the game is solved and the program stops.

If you think you have a few good ideas but don't know how to start, you could try writing a program to solve the following problem.

You are as usual, alone in a system of caves/rooms that stretch into the distance to the East and the West. You are carrying a hod of bricks and five cards on which is written the following:

Card	Empty	Not empty
1	DROP,E,2	GET,W,3
2	DROP,E,3	GET,E,5
3	DROP,W,1	GET,E,2
4	DROP,W,3	E,1
5	E,4	STOP

All the caves are empty and all you

have to do is take the role of the computer for a change - in other words obey the instruction on the cards beginning with card 1 which says:

If this cave is Empty THEN Drop a brick, go East, and obey card 2. Alternatively Get the brick, go West and obey card 3.

If you follow the instructions correctly you will eventually reach the STOP on card 5. The questions are: a) How many bricks will you drop, and b) How many E/W moves will you make?

A couple of hints - you should never have to go further than 10 caves to the West. Nevertheless, don't try solving the problem with real bricks, there are a lot of moves involved and you probably will need to write a program to solve it.

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# Try life in the RAW and you'll opt out of op codes

**ROLAND WADDILOVE**  
takes some of the toil out of  
machine code programming  
with his RAW assembler

AS you probably know, a machine code program consists of a series of binary numbers in the range 0 to 255, although we normally use hexadecimal or decimal as it's easier to follow.

Even so, programs are very difficult to read. For example, what does \$A5 \$D4 mean? Very little I should imagine, unless you know all the opcodes off by heart.

Assembly language is much easier to digest. A mnemonic is used to represent each machine code instruction.

For example, the codes above can be represented by:

**LDA \$D4**

which is much more meaningful. It's not perfect but it's a big improvement.

**.byte=\$D4  
LDA byte**

is even better.

What an assembler does is to convert these assembly language mnemonics into machine code for you, taking all the hard work and tedium out of it. There's no need to look up the opcodes at all.

Assembly listings are easier to follow and much easier to debug if they don't work first time — and they rarely do.

RAW, the assembler presented here, will allow you to write assembly language programs. The assembly

listing can be saved along with RAW and the machine code run using the USR function.

Listing 1 shows an example of what is possible with RAW and demonstrates some of its functions. It's a short program to convert any upper case letters in a string to lower case.

To use it, enter:

**X=USR(1616,ADR(A\$),  
LEN(A\$))**

where A\$ is the string to be converted after assembling the routine.

The assembly listing is entered as a series of data statements. Multiple statement lines are possible by separating the statements with commas and comments can be included by placing them in REM statements.

The first part of an assembler instruction is always three letters. This must be followed by one space if there is a further part. The comma in indexed instructions should be replaced by a full stop otherwise RAW will get confused.

Implied instructions are always one part. For example:

**RTS**

All other instructions are two part. Like this:

**ASL A  
LDA 27**

```

1A DATA 000 0000
2A DATA .11:004
3A DATA .12:000
4A DATA PLA
5A DATA PLA
6A DATA STA 13
7A DATA PLA
8A DATA STA 13
9A DATA PLA
1AA DATA PLA
11A DATA TST
12A DATA BEY
13A DATA .loop
14A DATA LDA CL3.Y
15A DATA CMP 000
16A DATA ACC NEXT
17A DATA CMP 001
18A DATA BEY NEXT
19A DATA 000 0000
20A DATA STA CL3.Y
21A DATA .next
22A DATA BEY
23A DATA BPL loop
24A DATA RTS
25A DATA END
26A REM
  
```

Listing 1

# The rules are strict but you'll find RAW friendly

Notice the single space between the first and second part. Indexed instructions are also two part, such as:

**LDA (\$D4),Y  
CMP byte,X**

The commas need to be replaced by full stops for RAW to understand them, so they become:

**LDA (\$D4).Y  
CMP byte.X**

Numbers can be either decimal or hexadecimal. Hex numbers are preceded by \$. A label can be used instead of a number and it's possible to have a forward reference to a label as it's a two pass assembler.

The first instruction must be ORG followed by a number. This tells RAW where to place the object code.

The first 55 bytes of Page 6 in the

memory are used by the assembler but the rest is free. So:

**ORG \$650**

will set the object code address to 1616 decimal, \$650 hex.

Space for the object code can be reserved by moving RAMTOP down. RAMTOP is the highest point in memory available to Basic, and

**? PEEK(106)\*256**

will tell you what it is currently set to. To reserve 1k of memory - four pages - use:

**POKE(106),PEEK(106)-4**

then enter a GRAPHICS command to relocate the display list and data.

Please note however, that the first 800 bytes above RAMTOP may be corrupted by scrolling a text window, using CLEAR or clearing the screen

```
0000 REM ***** Assembler
0010 REM BY R.S.Maddison
0020 REM C64 Star! User
0030 REM *****
0040 FOR P=1024 TO 1
0050 Y=CHR$(128+P/256)
0060 PRINT Y;P;
0070 IF P=255 THEN PRINT "*****"
0080 IF P=511 THEN PRINT "*****"
0090 IF P=767 THEN PRINT "*****"
0100 IF P=1023 THEN PRINT "*****"
0110 IF P=1279 THEN PRINT "*****"
0120 IF P=1535 THEN PRINT "*****"
0130 IF P=1791 THEN PRINT "*****"
0140 IF P=2047 THEN PRINT "*****"
0150 IF P=2303 THEN PRINT "*****"
0160 IF P=2559 THEN PRINT "*****"
0170 IF P=2815 THEN PRINT "*****"
0180 IF P=3071 THEN PRINT "*****"
0190 IF P=3327 THEN PRINT "*****"
0200 IF P=3583 THEN PRINT "*****"
0210 IF P=3839 THEN PRINT "*****"
0220 IF P=4095 THEN PRINT "*****"
0230 IF P=4351 THEN PRINT "*****"
0240 IF P=4607 THEN PRINT "*****"
0250 IF P=4863 THEN PRINT "*****"
0260 IF P=5119 THEN PRINT "*****"
0270 IF P=5375 THEN PRINT "*****"
0280 IF P=5631 THEN PRINT "*****"
0290 IF P=5887 THEN PRINT "*****"
0300 IF P=6143 THEN PRINT "*****"
0310 IF P=6399 THEN PRINT "*****"
0320 IF P=6655 THEN PRINT "*****"
0330 IF P=6911 THEN PRINT "*****"
0340 IF P=7167 THEN PRINT "*****"
0350 IF P=7423 THEN PRINT "*****"
0360 IF P=7679 THEN PRINT "*****"
0370 IF P=7935 THEN PRINT "*****"
0380 IF P=8191 THEN PRINT "*****"
0390 IF P=8447 THEN PRINT "*****"
0400 IF P=8703 THEN PRINT "*****"
0410 IF P=8959 THEN PRINT "*****"
0420 IF P=9215 THEN PRINT "*****"
0430 IF P=9471 THEN PRINT "*****"
0440 IF P=9727 THEN PRINT "*****"
0450 IF P=9983 THEN PRINT "*****"
0460 IF P=10239 THEN PRINT "*****"
0470 IF P=10495 THEN PRINT "*****"
0480 IF P=10751 THEN PRINT "*****"
0490 IF P=11007 THEN PRINT "*****"
0500 IF P=11263 THEN PRINT "*****"
0510 IF P=11519 THEN PRINT "*****"
0520 IF P=11775 THEN PRINT "*****"
0530 IF P=12031 THEN PRINT "*****"
0540 IF P=12287 THEN PRINT "*****"
0550 IF P=12543 THEN PRINT "*****"
0560 IF P=12799 THEN PRINT "*****"
0570 IF P=13055 THEN PRINT "*****"
0580 IF P=13311 THEN PRINT "*****"
0590 IF P=13567 THEN PRINT "*****"
0600 IF P=13823 THEN PRINT "*****"
0610 IF P=14079 THEN PRINT "*****"
0620 IF P=14335 THEN PRINT "*****"
0630 IF P=14591 THEN PRINT "*****"
0640 IF P=14847 THEN PRINT "*****"
0650 IF P=15103 THEN PRINT "*****"
0660 IF P=15359 THEN PRINT "*****"
0670 IF P=15615 THEN PRINT "*****"
0680 IF P=15871 THEN PRINT "*****"
0690 IF P=16127 THEN PRINT "*****"
0700 IF P=16383 THEN PRINT "*****"
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0990 IF P=23807 THEN PRINT "*****"
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3500 IF P=88064 THEN PRINT "*****"
3510 IF P=88320 THEN PRINT "*****"
3520 IF P=88576 THEN PRINT "*****"
3530 IF P=88832 THEN PRINT "*****"
3540 IF P=89088 THEN PRINT "*****"
3550 IF P=89344 THEN PRINT "*****"
3560 IF P=89600 THEN PRINT "*****"
3570 IF P=89856 THEN PRINT "*****"
3580 IF P=90112 THEN PRINT "*****"
3590 IF P=90368 THEN PRINT "*****"
3600 IF P=90624 THEN PRINT "*****"
3610 IF P=90880 THEN PRINT "*****"
3620 IF P=91136 THEN PRINT "*****"
3630 IF P=91392 THEN PRINT "*****"
3640 IF P=91648 THEN PRINT "*****"
3650 IF P=91904 THEN PRINT "*****"
3660 IF P=92160 THEN PRINT "*****"
3670 IF P=92416 THEN PRINT "*****"
3680 IF P=92672 THEN PRINT "*****"
3690 IF P=92928 THEN PRINT "*****"
3700 IF P=93184 THEN PRINT "*****"
3710 IF P=93440 THEN PRINT "*****"
3720 IF P=93696 THEN PRINT "*****"
3730 IF P=93952 THEN PRINT "*****"
3740 IF P=94208 THEN PRINT "*****"
3750 IF P=94464 THEN PRINT "*****"
3760 IF P=94720 THEN PRINT "*****"
3770 IF P=94976 THEN PRINT "*****"
3780 IF P=95232 THEN PRINT "*****"
3790 IF P=95488 THEN PRINT "*****"
3800 IF P=95744 THEN PRINT "*****"
3810 IF P=96000 THEN PRINT "*****"
3820 IF P=96256 THEN PRINT "*****"
3830 IF P=96512 THEN PRINT "*****"
3840 IF P=96768 THEN PRINT "*****"
3850 IF P=97024 THEN PRINT "*****"
3860 IF P=97280 THEN PRINT "*****"
3870 IF P=97536 THEN PRINT "*****"
3880 IF P=97792 THEN PRINT "*****"
3890 IF P=98048 THEN PRINT "*****"
3900 IF P=98304 THEN PRINT "*****"
3910 IF P=98560 THEN PRINT "*****"
3920 IF P=98816 THEN PRINT "*****"
3930 IF P=99072 THEN PRINT "*****"
3940 IF P=99328 THEN PRINT "*****"
3950 IF P=99584 THEN PRINT "*****"
3960 IF P=99840 THEN PRINT "*****"
3970 IF P=100096 THEN PRINT "*****"
3980 IF P=100352 THEN PRINT "*****"
3990 IF P=100608 THEN PRINT "*****"
4000 IF P=100864 THEN PRINT "*****"
4010 IF P=101120 THEN PRINT "*****"
4020 IF P=101376 THEN PRINT "*****"
4030 IF P=101632 THEN PRINT "*****"
4040 IF P=101888 THEN PRINT "*****"
4050 IF P=102144 THEN PRINT "*****"
4060 IF P=102400 THEN PRINT "*****"
4070 IF P=102656 THEN PRINT "*****"
4080 IF P=102912 THEN PRINT "*****"
4090 IF P=103168 THEN PRINT "*****"
4100 IF P=103424 THEN PRINT "*****"
4110 IF P=103680 THEN PRINT "*****"
4120 IF P=103936 THEN PRINT "*****"
4130 IF P=104192 THEN PRINT "*****"
4140 IF P=104448 THEN PRINT "*****"
4150 IF P=104704 THEN PRINT "*****"
4160 IF P=104960 THEN PRINT "*****"
4170 IF P=105216 THEN PRINT "*****"
4180 IF P=105472 THEN PRINT "*****"
4190 IF P=105728 THEN PRINT "*****"
4200 IF P=105984 THEN PRINT "*****"
4210 IF P=106240 THEN PRINT "*****"
4220 IF P=106496 THEN PRINT "*****"
4230 IF P=106752 THEN PRINT "*****"
4240 IF P=107008 THEN PRINT "*****"
4250 IF P=107264 THEN PRINT "*****"
4260 IF P=107520 THEN PRINT "*****"
4270 IF P=107776 THEN PRINT "*****"
4280 IF P=108032 THEN PRINT "*****"
4290 IF P=108288 THEN PRINT "*****"
4300 IF P=108544 THEN PRINT "*****"
4310 IF P=108800 THEN PRINT "*****"
4320 IF P=109056 THEN PRINT "*****"
4330 IF P=109312 THEN PRINT "*****"
4340 IF P=109568 THEN PRINT "*****"
4350 IF P=109824 THEN PRINT "*****"
4360 IF P=110080 THEN PRINT "*****"
4370 IF P=110336 THEN PRINT "*****"
4380 IF P=110592 THEN PRINT "*****"
4390 IF P=110848 THEN PRINT "*****"
4400 IF P=111104 THEN PRINT "*****"
4410 IF P=111360 THEN PRINT "*****"
4420 IF P=111616 THEN PRINT "*****"
4430 IF P=111872 THEN PRINT "*****"
4440 IF P=112128 THEN PRINT "*****"
4450 IF P=112384 THEN PRINT "*****"
4460 IF P=112640 THEN PRINT "*****"
4470 IF P=112896 THEN PRINT "*****"
4480 IF P=113152 THEN PRINT "*****"
4490 IF P=113408 THEN PRINT "*****"
4500 IF P=113664 THEN PRINT "*****"
4510 IF P=113920 THEN PRINT "*****"
4520 IF P=114176 THEN PRINT "*****"
4530 IF P=114432 THEN PRINT "*****"
4540 IF P=114688 THEN PRINT "*****"
4550 IF P=114944 THEN PRINT "*****"
4560 IF P=115200 THEN PRINT "*****"
4570 IF P=115456 THEN PRINT "*****"
4580 IF P=115712 THEN PRINT "*****"
4590 IF P=115968 THEN PRINT "*****"
4600 IF P=116224 THEN PRINT "*****"
4610 IF P=116480 THEN PRINT "*****"
4620 IF P=116736 THEN PRINT "*****"
4630 IF P=116992 THEN PRINT "*****"
4640 IF P=117248 THEN PRINT "*****"
4650 IF P=117504 THEN PRINT "*****"
4660 IF P=117760 THEN PRINT "*****"
4670 IF P=118016 THEN PRINT "*****"
4680 IF P=118272 THEN PRINT "*****"
4690 IF P=118528 THEN PRINT "*****"
4700 IF P=118784 THEN PRINT "*****"
4710 IF P=119040 THEN PRINT "*****"
4720 IF P=119296 THEN PRINT "*****"
4730 IF P=119552 THEN PRINT "*****"
4740 IF P=119808 THEN PRINT "*****"
4750 IF P=120064 THEN PRINT "*****"
4760 IF P=120320 THEN PRINT "*****"
4770 IF P=120576 THEN PRINT "*****"
4780 IF P=120832 THEN PRINT "*****"
4790 IF P=121088 THEN PRINT "*****"
4800 IF P=121344 THEN PRINT "*****"
4810 IF P=121600 THEN PRINT "*****"
4820 IF P=121856 THEN PRINT "*****"
4830 IF P=122112 THEN PRINT "*****"
4840 IF P=122368 THEN PRINT "*****"
4850 IF P=122624 THEN PRINT "*****"
4860 IF P=122880 THEN PRINT "*****"
4870 IF P=123136 THEN PRINT "*****"
4880 IF P=123392 THEN PRINT "*****"
4890 IF P=123648 THEN PRINT "*****"
4900 IF P=123904 THEN PRINT "*****"
4910 IF P=124160 THEN PRINT "*****"
4920 IF P=124416 THEN PRINT "*****"
4930 IF P=124672 THEN PRINT "*****"
4940 IF P=124928 THEN PRINT "*****"
4950 IF P=125184 THEN PRINT "*****"
4960 IF P=125440 THEN PRINT "*****"
4970 IF P=125696 THEN PRINT "*****"
4980 IF P=125952 THEN PRINT "*****"
4990 IF P=126208 THEN PRINT "*****"
5000 IF P=126464 THEN PRINT "*****"
5010 IF P=126720 THEN PRINT "*****"
5020 IF P=126976 THEN PRINT "*****"
5030 IF P=127232 THEN PRINT "*****"
5040 IF P=127488 THEN PRINT "*****"
5050 IF P=127744 THEN PRINT "*****"
5060 IF P=128000 THEN PRINT "*****"
5070 IF P=128256 THEN PRINT "*****"
5080 IF P=128512 THEN PRINT "*****"
5090 IF P=128768 THEN PRINT "*****"
5100 IF P=129024 THEN PRINT "*****"
5110 IF P=129280 THEN PRINT "*****"
5120 IF P=129536 THEN PRINT "*****"
5130 IF P=129792 THEN PRINT "*****"
5140 IF P=130048 THEN PRINT "*****"
5150 IF P=130304 THEN PRINT "*****"
5160 IF P=130560 THEN PRINT "*****"
5170 IF P=130816 THEN PRINT "*****"
5180 IF P=131072 THEN PRINT "*****"
5190 IF P=131328 THEN PRINT "*****"
5200 IF P=131584 THEN PRINT "*****"
5210 IF P=131840 THEN PRINT "*****"
5220 IF P=132096 THEN PRINT "*****"
5230 IF P=132352 THEN PRINT "*****"
5240 IF P=132608 THEN PRINT "*****"
5250 IF P=132864 THEN PRINT "*****"
5260 IF P=133120 THEN PRINT "*****"
5270 IF P=133376 THEN PRINT "*****"
5280 IF P=133632 THEN PRINT "*****"
5290 IF P=133888 THEN PRINT "*****"
5300 IF P=134144 THEN PRINT "*****"
5310 IF P=134400 THEN PRINT "*****"
5320 IF P=134656 THEN PRINT "*****"
5330 IF P=134912 THEN PRINT "*****"
5340 IF P=135168 THEN PRINT "*****"
5350 IF P=135424 THEN PRINT "*****"
5360 IF P=135680 THEN PRINT "*****"
5370 IF P=135936 THEN PRINT "*****"
5380 IF P=136192 THEN PRINT "*****"
5390 IF P=136448 THEN PRINT "*****"
5400 IF P=136704 THEN PRINT "*****"
5410 IF P=136960 THEN PRINT "*****"
5420 IF P=137216 THEN PRINT "*****"
5430 IF P=137472 THEN PRINT "*****"
5440 IF P=137728 THEN PRINT "*****"
5450 IF P=137984 THEN PRINT "*****"
5460 IF P=138240 THEN PRINT "*****"
5470 IF P=138496 THEN PRINT "*****"
5480 IF P=138752 THEN PRINT "*****"
5490 IF P=139008 THEN PRINT "*****"
5500 IF P=139264 THEN PRINT "*****"
5510 IF P=139520 THEN PRINT "*****"
5520 IF P=139776 THEN PRINT "*****"
5530 IF P=140032 THEN PRINT "*****"
5540 IF P=140288 THEN PRINT "*****"
5550 IF P=140544 THEN PRINT "*****"
5560 IF P=140800 THEN PRINT "*****"
5570 IF P=141056 THEN PRINT "*****"
5580 IF P=141312 THEN PRINT "*****"
5590 IF P=141568 THEN PRINT "*****"
5600 IF P=141824 THEN PRINT "*****"
5610 IF P=142080 THEN PRINT "*****"
5620 IF P=142336 THEN PRINT "*****"
5630 IF P=142592 THEN PRINT "*****"
5640 IF P=142848 THEN PRINT "*****"
5650 IF P=143104 THEN PRINT "*****"
5660 IF P=143360 THEN PRINT "*****"
5670 IF P=143616 THEN PRINT "*****"
5680 IF P=143872 THEN PRINT "*****"
5690 IF P=144128 THEN PRINT "*****"
5700 IF P=144384 THEN PRINT "*****"
5710 IF P=144640 THEN PRINT "*****"
5720 IF P=144896 THEN PRINT "*****"
5730 IF P=145152 THEN PRINT "*****"
5740 IF P=145408 THEN PRINT "*****"
5750 IF P=145664 THEN PRINT "*****"
5760 IF P=145920 THEN PRINT "*****"
5770 IF P=146176 THEN PRINT "*****"
5780 IF P=146432 THEN PRINT "*****"
5790 IF P=146688 THEN PRINT "*****"
5800 IF P=146944 THEN PRINT "*****"
5810 IF P=147200 THEN PRINT "*****"
5820 IF P=147456 THEN PRINT "*****"
5830 IF P=147712 THEN PRINT "*****"
5840 IF P=147968 THEN PRINT "*****"
5850 IF P=148224 THEN PRINT "*****"
5860 IF P=148480 THEN PRINT "*****"
5870 IF P=148736 THEN PRINT "*****"
5880 IF P=148992 THEN PRINT "*****"
5890 IF P=149248 THEN PRINT "*****"
5900 IF P=149504 THEN PRINT "*****"
5910 IF P=149760 THEN PRINT "*****"
5920 IF P=150016 THEN PRINT "*****"
5930 IF P=150272 THEN PRINT "*****"
5940 IF P=150528 THEN PRINT "*****"
5950 IF P=150784 THEN PRINT "*****"
5960 IF P=151040 THEN PRINT "*****"
5970 IF P=151296 THEN PRINT "*****"
5980 IF P=151552 THEN PRINT "*****"
5990 IF P=151808 THEN PRINT "*****"
6000 IF P=152064 THEN PRINT "*****"
6010 IF P=152320 THEN PRINT "*****"
6020 IF P=152576 THEN PRINT "*****"
6030 IF P=152832 THEN PRINT "*****"
6040 IF P=153088 THEN PRINT "*****"
6050 IF P=153344 THEN PRINT "*****"
6060 IF P=153600 THEN PRINT "*****"
6070 IF P=153856 THEN PRINT "*****"
6080 IF P=154112 THEN PRINT "*****"
6090 IF P=154368 THEN PRINT "*****"
6100 IF P=154624 THEN PRINT "*****"
6110 IF P=154880 THEN PRINT "*****"
6120 IF P=155136 THEN PRINT "*****"
6130 IF P=155392 THEN PRINT "*****"
6140 IF P=155648 THEN PRINT "*****"
6150 IF P=155904 THEN PRINT "*****"
6160 IF P=156160 THEN PRINT "*****"
6170 IF P=156416 THEN PRINT "*****"
6180 IF P=156672 THEN PRINT "*****"
6190 IF P=156928 THEN PRINT "*****"
6200 IF P=157184 THEN PRINT "*****"
6210 IF P=157440 THEN PRINT "*****"
6220 IF P=157696 THEN PRINT "*****"
6230 IF P=157952 THEN PRINT "*****"
6240 IF P=158208 THEN PRINT "*****"
6250 IF P=1
```





## Part II of MIKE ROWE's series on how to give your program displays the professional touch

**A CUSTOM display list, mixing several modes on the same screen, can quickly and easily give your display a professional touch.**

There are two ways to create one. Firstly you can modify a standard display list created by the operating system after a Graphics call. Secondly you can create an entirely new list from scratch, or even have several display lists in memory at the same time.

Before you start to construct your list there are several problems to be considered.

If you are modifying an existing display list it is safest to use the graphics mode that takes up most memory in your final display list as a starting point for your modified list.

Also try to avoid your screen memory crossing a 4k boundary—4k, 8k, 12k, and so on to 48k—as it will cause problems. If you must cross a border, say if an 8k mode is used, then when the screen reaches the boundary you need to insert another load memory scan—see last month's article—in the display list to point to the start of the next 4k block of screen RAM.

Different graphics modes take up a different amount of screen RAM per line. If the operating system expects a line to take 40 bytes and in the modified list a line takes only 20, then the data below this line will be shifted half way across the screen.

There are two ways of avoiding problems with this. First you can use "dirty programming" and design your new lines in groups of lines which add to make the correct number of bytes—see examples later.

The other way is to avoid using the operating system for Drawto, Plot or

Print commands and poke directly to screen memory.

If you are to use Basic commands such as Plot, Drawto or Print on the screen you may need to fool the OS into thinking it is drawing on the correct screen.

This is done by poking location 87 (\$57) with the Basic graphics mode of the line involved.

Second is the problem of Basic checking each command to check that it is in the range allowed by the graphics mode it thinks is in use.

This can commonly lead to Basic thinking it is going to print off the screen and giving an error when you know full well that it is on the screen.

This is solved by tampering with locations 88 and 89. These contain the location of the top left corner of screen memory and the OS uses these to calculate the legality of a screen command.

The top corner can be calculated by  $PEEK(88)+PEEK(89)*256$ . If

these locations are poked with the memory location of the start of the line to which you want to plot or print, then the start of this line becomes position 0,0 and therefore within legal range.

Knowing the number of bytes taken up per line in each mode is therefore needed as it is for the second point above.

Basic mode	Antic mode	Bytes per line
0	2	40
1	6	20
2	7	20
3	8	10
4	9	10
5	10	20
6	11	20
7	13	40
8	15	40
9	15	40
10	15	40
11	15	40

On to some examples. The

# There are ways round those dirty programming techniques

### Display List

```

0 REM CUSTOM DISPLAY LIST DEMO 1
10 GRAPHICS SCREEN GET 05 TO CREATE B2S
   PLAY LIST
20 BLST=PEEK$C6000+PEEK$04011*SCREEN F
   END START OF DISPLAY LIST
30 POKE BLST+15,71:POKE CHANGE 1ST GRAP
   HICS INSTRUCTION FROM AN C64T:LN+4C6
   POKE 0 TO 447:GRAPHICS 23
40 POKE BLST+16,0:POKE CHANGE LINE 2 TO
   RM 2:GRAPHICS 03 TO 4:GRAPHICS 13
50 REM CHANGE 2 LINES TO ADDIN+SOFTEN
   & THE REST OF THE DISPLAY BY HALF A SC
   REEN
60 POSITION 2,0,IT = GRAPHICS 0

```

### Programs /

simplest way to write a modified list is shown in Program 1. This will add two lines for a larger, coloured title to the top of a Graphics 0 screen.

It works, but again it is dirty programming. The maximum number of scan lines allowed in a display list is usually 192. This display list is more than 192 scan lines long.

In reality Antic can cope with slightly more lines than the theoretical maximum. I have found that an extra 24 usually is stable, but more than this and the screen will roll.

See last month's article for a table of the number of scan lines for each mode line.

A better programming technique would be to calculate the number of scan lines being used and make sure that the total is 192 or less. This will usually involve moving the end of the display list and rewriting it as in Program II.

As can be seen, the end of the display list is indicated by a number 65-41. The two numbers following this are the location of the start of the display list in the order Low Byte, High Byte. Therefore the first number can be found by PEEK(560) and the second by PEEK(561), as these should be the same.

The third way is to create your own list from scratch. This is how virtually all machine code programs get their displays and one of the reasons that they can be so spectacular.

If you avoid using the OS to draw to the screen then many of the limitations of custom display lists also

```
0 RED GRAPHIC DISPLAY LIST NOW I
10 GRAPHICS 7:HIGH MUST MEMORY GROWN IN
   RED USED
20 START=PEED000+PEER000+PS000 P
30 END OF DISPLAY LIST
40 LOW=PEE000;HIGH=PEE000;RED ME
   BY LOCATIONS OF START OF SCHEM
40 SETCLO 3,1,1
50 PORE BLIST#Z,6447;DCH COUNT INT L
   LINE TO GRAPHICS Z
60 FOR Z=BLIST#6 TO BLIST#62:PONE Z,Z
   TIGHT I:RED ONLY 40 LINES GRAPHICS Z
   ACTUALLY ALREADY IS - COULD LEAVE
   120 PORE BLIST#A,A;PORE BLIST#B,B;H
       O Z LINES OF GRAPHICS Z 0.8-Z LINES H
       EXPS LINE MEMORY REQUIREMENTS AS 490
130 PORE BLIST#A,A;HWH A LINE OF GRAP
   HICS ITGILL MORE ON M0R-ALIS
140 FOR 37OLEST#67 TO BLIST#6;PONE Z,
   TIGHT I:RED Z LINES OF GRAPHICS O
150 PORE BLIST#A,A;SDEN END OF DISPLA
   Y LIST
160 PORE BLIST#AA,PEE000;IPORE BLIST
   #AA,PEE000;IDEN POINT BACK TO START
   OF DISPLAY LIST
180 POSITION 9,9;PONE 97,217 M0J DISP
   LAY LIST REMOVED FROM TOP LINE
220 LOW=L0W000;I1 LOW25A THEN LOWL00
   -250;IDEN=D000;I1 LOW25A CALCULATE NEW
```

**Figures 6**

```

120 LEFT COLUMN I LINE 0000
130 PORE 00,LOC=PORE 03,HIGH=PORE 07,7
140 TELL 05 THAT 200 LINE IS TOP OF 5
150 GREEN AND TELL 05 THAT IS MORE 7
160 COLOR I:PL0T 0,141F00 10 TO 1A7:0
1800 I,1510C1310201E4:HEXT 1500 00A0
181000
190 COLOR I:PL0T 0,01000010 10,010000
20 TO 15,0100000 0,01000010 0,0
210 LOC=LOC+000000
220 IF 1005255 THEN LOC=LOC+250010100
230000000 230
240 PORE 00,LOC=PORE 07,0100:HEX RECA
250 LATED HERE LOC MEMORY LOC=230 AND
260 FOR 05 THAT IT'S THE TOP OF SCREEN
270 PORE 07,1000 TELL 05 THAT IT'S 00
2800000 1
290 POS=11200 0,0
300 7 00:" PORE=LOC HERE INVERS
310 7 00:" 1905"
320 PORE 07,1100 I=2 TO 0017 00:CH000
3301:HEXT I
340 PORE 702,1
350 PORE 07,11" 001" This demonstration
360 shows a simple kind of multiple and
370 a display that can be =
380 7 00:" obtained by customizing an
390 existing display list."

```

```

0 REM PROGRAM 2
1 REM RUN TIME 1986
2 REM ENTER PROGRAM CITED INTO ALL OF
MY 60 BUSES ALL OF THEM BUT
10 DIM BLOC(20), SCREEN(1000)
TO KEY STORE DISPLAY LIST AND SCORES IN
MEMORY 20 STRINGS
130 SC=0:SCREEN=0:SCREEN=INT(5/256)
150 SC=SC+SCREEN:256-SCREEN:REM CALCULATE LOW
AND HIGH BYTES OF SCREEN MEMORY
180 BL=BLOC(15):BLHIGH=INT(16/256):BL
LOW=BL-BLHIGH:REM NOW AGAIN FOR 60
BYTES OF DISPLAY LIST
190 FOR I=0, BLLOW:FOR J=0, BLHIGH:REM
TELL ABOUT THE STATE OF THE DISPLAY L
IST
200 FOR I=0 TO 25:REM A:BL(I)=0:FOR
A=NEXT I:REM READ IN DATA FOR DISPLAY
LIST
230 FOR BL=4, SCREEN:FOR BL=5, SCREEN:RE
M TELL DISPLAY LIST STATE OF SCREEN M
EMORY
250 FOR BL=124, BLLOW:FOR BL=125, BLHIGH
:REM PRINT END OF DISPLAY LIST NOW TO
START
300 SCREENS(1)=0:FOR S=1:SCREENS(2000)=0
:REM 40:SCREEN(47)=SCREEN(1000)=1000:

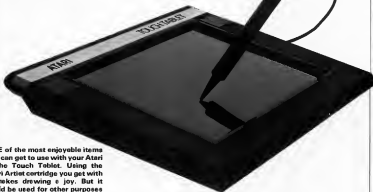
```

Programs All

```
ALL OF SCREEN MEMORY
110 SCREEN=0:00000000:00000000:00000000
120 SCREEN=1:HEX INVERSE IN NOTES
130 FOR I=100 TO 95:POKE I+56,71:NEXT I
140 FOR I=100 TO 75:POKE I+56,11:NEXT I
150 FOR I=100 TO 95:POKE I+56,71:NEXT I
160 FOR I=100 TO 125:POKE I+56,71:NEXT I
170 FOR I=100 TO 140:POKE I+56,11:NEXT I
180 FOR I=100 TO 175:POKE I+56,71:NEXT I
190 FOR I=100 TO 195:POKE I+56,11:NEXT I
200 FOR I=200 TO 215:POKE I+56,71:NEXT I
210 SCREENS(250)=CORNFLAK
220 SCREENS(260)=BARS
230 SCREENS(270)=HEX INVERSE 0
240 REM ALL ABOVE IS THE DATA BEING TO
    BE HELD IN SCREENS TO CODE THE SIMPLE
    SIMPLON
250 DATA 111,112,117,71,0,9,7,111,10,
    10,10,10,10,10,10,10,112,7,0,7,0,
    5,0,9
```



**KEN WARD** puts you in touch with software to let your fingers – or a stylus – do the working



ONE of the most enjoyable items you can get to use with your Atari is the Touch Tablet. Using the Atari Artist cartridge you get with it makes drawing a joy. But it could be used for other purposes as well.

The Touch Tablet can be used anywhere a joystick, peddle, light pen or mouse would be used, and it's faster than most.

You don't have to drag the cursor across the screen as with the joystick, peddle or mouse. You place your pen where you want it straight away.

And the advantage over the light pen is that you don't have to pick anything up – you just use your finger or the stylus.

The only problem is that at the moment not a lot of software is available for it. The only commercial program I know of that has a Touch Tablet option is The Music Construction Set from Electronic Arts.

Having tried it, I can say that the program certainly is a lot easier to use with the Touch Tablet than with a joystick. So it's up to us to supply our own programs until the software houses get around to it.

OK, so where do we start? The tablet can be read by:

**PADDLE(0):** Horizontal readings  
**PADDLE(1):** Vertical readings

The readings given are between 1 and 228. The horizontal ones are from left, 1, to right, 228, and the vertical ones from bottom 1, to top 228. So we have two problems to

## Take a tablet for more than drawing

overcome before using these readings.

- They have to be related to screen positions – we don't have a 228 by 228 pixel screen to work with. Also in converting the figures to relate to the screen we have to invert the vertical readings. If we are going to use a player/missile for the cursor, we have the added problem of coordinating P/M positions and screen position.

- We have to deal with the cursor wobble common to all variable resistance input devices.

The triggers on the tablet can be read at PTRIG(0) and 1 or at STICK(0). The trigger on the plug-in pen can only be read at STICK(0). So for simple inputs it is easier to use STICK(0). If STICK(0)<15 then one of the triggers has been pressed.

For example, let's assume we are going to work in Graphics 0. The first thing to do is to relate the 228 reading from the tablet to the 40

characters on the screen.

We could simply divide 228 by 40 which gives us a divisor of 5.7, which would work fine apart from one small problem – it means that for the extreme left and right positions we would be right up against the frame of the tablet.

The ideal area to work in is marked on the tablet, which is far enough in to allow even the biggest finger to get to the edge. Remember, not everyone will want to use the stylus.

So let's look at it in practice:

```
10 GRAPHICS 0
20 X:=0:Y:=0:PADDLE(0)/5.7-1
30 Y:=24-INT(PADDLE(1)/5.7)
40 POSITION 10,20:V, Y, Y: "
50 GOTO 20
```

If you try this out you'll see that we now have an additional problem –



Figure 1: Using the touch tablet as a keyboard

readings outside the screen range. But it's only a minor one. We can overcome it with a series of IF X<0... IF X>39... IF Y<0... IF Y>39...

If that was all there was to it we would all be churning out Touch Tablet programs.

Try this one and you'll see the other problems.

```
10 GRAPHICS 7
20 X=INT(PADDLE(0)/1.33-11
30 Y=INT(C315-PADDLE(33)/2.1)
40 IF X=0 THEN X=0
50 IF X=159 THEN X=159
60 IF Y=0 THEN Y=0
70 IF Y=179 THEN Y=179
80 COLOR 1: PLOT X,Y
90 GOTO 20
```

The first is that you have to go slowly to draw a continuous line, and if you were fleshing a cursor and checking for trigger and/or key presses it would be even slower.

The second problem is the odd random pixel being drawn as you lift and lower the stylus to the pad.

My solution is a vertical blink routine to read the PADDLES four times, average out the readings, and store the result.

The random pixels problem is a question of checking for a "stylus off" reading. This part I've handled in the basic programming. To save processing time in calculating the X-Y coordinates and checking those out of cursor range, I've added a routine

to work them all out and store them in an array during the initialization.

The programs that follow demonstrate ways of using the Touch Tablet.

Tablet Zero is a demo of using the Touch Tablet as a selection device.

Tablet 8 is a Graphics 8 drawing program. As you will see from this, even with the VBI routine it is painfully slow drawing a continuous line. Part of the problem is that the Graphics 8 screen has a higher resolution than the Touch Tablet, which means you have to Plot and Drawto.

So now the ball is in your court. If you can improve on my ideas, send them in. And if you come up with a program using the Touch Tablet send that in too.

As a final suggestion of a use for the Touch Tablet, how about an alternative one finger keyboard handler for handicapped people?

It covers a smaller area than the keyboard, and all the multiple key inputs could be handled as a cumulative input.

The screen for such a program could look like the one shown in Figure 1.

A young handicapped friend of ours has a prototype - and very expensive - speech device that is limited to the number of words that can be stored in its memory and printed on the pad surface. Imagine what could be done with a program such as I've described running with S.A.M. ...

```
10 REM *****
20 REM ** TABLET - ZERO **
30 REM ** TOUCH TABLET DEMONSTRATION **
40 REM ** BY CEB M000 **
50 REM *****
60 GOSUB 210
70 REM *****
80 @H000PEEK(20433):Y=VEROPEEK(20433)
90 IF X=155 OR X=159 THEN GOTO 80
100 LOCATE X,Y:COLOR:COLOR: PLOT X,Y
110 IF STICK(0)=5 THEN COLOR:COLOR:
120 PLOT X,Y:GOSUB 150
130 COLOR:COLOR: PLOT X,Y:COLOR: PLOT X,Y:GOTO 80
140 REM *****
150 IF X=0 OR X=17 OR Y=0 OR Y=179 THEN
160 "YOU'RE OUTSIDE THE GRID - TRY AGA
170:GOTO 150:RETURN
180 IF X=2048 OR Y=0 Y=2048 OR Y=179
190 "YOU'RE ON A GRID LINE - TRY AGA
200:GOTO 150:RETURN
210 REM *****
220 REM *****
230 REM *****
240 REM *****
250 REM *****
260 REM *****
270 REM *****
280 REM *****
290 REM *****
300 REM *****
310 REM *****
320 REM *****
330 REM *****
340 REM *****
350 REM *****
360 REM *****
370 REM *****
380 REM *****
390 REM *****
400 REM *****
410 REM *****
420 REM *****
430 REM *****
440 REM *****
450 REM *****
460 REM *****
470 REM *****
480 REM *****
490 REM *****
500 REM *****
510 REM *****
520 REM *****
530 REM *****
540 REM *****
550 REM *****
560 REM *****
570 REM *****
580 REM *****
590 REM *****
600 REM *****
610 REM *****
620 REM *****
630 REM *****
640 REM *****
650 REM *****
660 REM *****
670 REM *****
680 REM *****
690 REM *****
700 REM *****
710 REM *****
720 REM *****
730 REM *****
740 REM *****
750 REM *****
760 REM *****
770 REM *****
780 REM *****
790 REM *****
800 REM *****
810 REM *****
820 REM *****
830 REM *****
840 REM *****
850 REM *****
860 REM *****
870 REM *****
880 REM *****
890 REM *****
900 REM *****
910 REM *****
920 REM *****
930 REM *****
940 REM *****
950 REM *****
960 REM *****
970 REM *****
980 REM *****
990 REM *****
```

```

420 DATA 6,136,16,231,158,3,185,167,6,
281,229,240,65,24,189,173,0,141,173,6,
165,0,189,174,6
430 DATA 141,174,6,136,16,231,78,173,6
,118,171,6,78,173,5,118,173,5,173,171,
6,133,282,78,174
440 DATA 6,118,173,6,78,174,6,118,173,
6,173,173,6,133,284,160,3,169,0,161,17
1,6,136,16,240
450 DATA 78,78,228,169,228,133,283,133
,284,78,148,6,0,0,0,0,0,0,0,0,0,0,0,0,
6,184,160,98,162,228,169,7,78,92,228
460 GOSUB C15363
470 POKE 51279,0
480 REM *****
490 POSITION 2,0:PRINT " A B C D E F G H I
J K L M N O P Q R "
500 ? " "
510 X=1:FOR A=1 TO 7 STEP 2
520 POSITION 1,9+0.17 * A:PRINT " | | | | |
| | | | | "
530 POSITION 1,9+0.17 * A:PRINT " | | | | |
| | | | | "
540 X=X+1:NEXT A
550 POSITION 1,18:PRINT " | | | | |
| | | | | "
560 POSITION 1,19:PRINT " | | | | |
| | | | | "
570 X=X+1:POKE 782,4
580 ? "A00 - ROM OFF THE TOUCH TABLET
782:?" "CHOOSE A SQUARE - "IT "PRESS TH
IS ONE ON SELECTION"
590 RETURN
600 REM *****
610 REM "A00"
620 REM "A" & "B" T/TOUCH PROGRAM "A"
630 REM "A" BY KEN MOORE
640 REM *****
650 GOTO 160
660 GRAPHICS 0+16:POKE 789,2:POKE 718,0
:REM:1
670 IF PEEK(7643)256 THEN GOTO 618
680 IF 0:555 AND 0:555 680 STICK(0)C15
THEN GOTO 740
690 IF 0:555 80:5:555 THEN GOTO 80
700 LOCATE 0,Y,COLOR:COLOR X:PLAT 0,Y
710 IF STICK(0)15 AND (C15)0-4) AND (
0:543) AND (C15)0-4) 680 (Y+0+3) THE
N COLOR X=PLAT X,0:GOTO 0,Y,0:X=C15:
Y
720 COLOR COLOR:PLAT 0,Y,C=0:IF X:1
THEN X=0
730 HIDE:Y:GOTO 80
740 REM *****
750 GRAPHICS 0+16:POKE 789,18:POKE 718,24
760 ? "N4"
770 ? "4" A GRAPHICS 0 GRAPHICS 0:GOTO 60

```

```

280 ? "4" FOR THE STAGE TOUCH TABLET
"
290 ? "N4" BY KEN MOORE"
290 REM *****
290 POSITION 9,11:PRINT "setting up arrays
..."
300 DIM ROM(2250),WRK(2250),TEMP(9),FILE
0(15),INPUT0(15)
310 FOR X=0 TO 220:ROM(0)=INT(0.52-1
5
320 IF 000(0)0 THEN 000(0)=0
330 IF 000(0)215 THEN 000(0)15
340 NEXT 0:000(0)=0:000
350 FOR X=0 TO 220:WRK(0)=215-0
360 IF WRK(0)0 THEN WRK(0)=0
370 IF WRK(0)15 THEN WRK(0)=15
380 NEXT 0:WRK(0)=0:000
390 REM *****
400 POSITION 9,11:PRINT "Feeding the points
now..."
410 FOR 0=1536 TO 1720:READ A:POKE 0,6
:NEXT 0
420 DATA 184,169,7,162,6,136,10,78,92,
218,173,182,6,281,4,248,28,172,162,6,1
73,132,2,153,163
430 DATA 6,173,113,2,153,167,6,208,148
,162,6,172,4,248,11,78,78,228,168,6,14
0,162,6,78,78
440 DATA 228,216,160,3,185,163,6,280,2
38,248,92,24,189,173,6,141,171,6,169,0
,169,173,5,143,173
450 DATA 5,136,16,231,158,3,185,167,6,
281,229,240,65,24,189,173,6,141,173,6,
165,0,189,174,6
460 DATA 141,174,6,136,16,231,78,173,6
,118,171,6,78,173,6,118,173,5,173,171,
6,133,282,78,174
470 DATA 6,118,173,6,78,174,6,118,173,
6,173,173,6,133,284,160,3,169,0,161,17
1,6,136,16,240
480 DATA 78,78,228,169,228,133,283,133
,284,78,148,6,0,0,0,0,0,0,0,0,0,0,0,0,
6,184,160,98,162,228,169,7,78,92,228
490 X=X+1:GOTO 160
500 POKE 51279,0:RETURN
510 REM *****
520 OFF=0:0(1713)
530 OPEN 01,0,FILE$
540 TOP=ZSRPEEK(1060):SC=PEEK(080)+2540
PEEK(089)
550 SETTOP=SC&1:INT(57/256):L0=57-0&1
:REM:0
560 POKE 050,11:POKE 052,PEEK(080):POKE
053,PEEK(089):POKE 054,L0:POKE 057,01
570 TIO=0:0(080)0"0A0ZL0",161:CLOSE 0
1
580 RESET:0(05363)
590 GRAPHICS 0+16+32:POKE 789,2:POKE 7
18,0:POKE 51279,0:GOTO 80
540 REM *****

```

```

550 OFF=0:0(1713)
560 OPEN 01,0,FILE$
570 POKE 050,7:POKE 052,PEEK(080):POKE
053,PEEK(089):POKE 054,256:POKE 057,255
580 TIO=0:0(080)0"0A0ZL0",161:CLOSE 0
1
590 RESET:0(05363)
600 GOSUB C15363:POKE 789,2:POKE 7
18,0:POKE 51279,0:GOTO 80
610 REM *****
620 IF PEEK(7643)256 THEN POKE 764,255:
630 680:GOTO 450
640 IF PEEK(7643)0 THEN POKE 764,255:0
650 680:GOTO 540
660 IF PEEK(7643)21 THEN POKE 764,255:
670 680:GOTO 80
680 IF PEEK(7643)15 THEN POKE 764,255:
690 680:GOTO 80
700 IF PEEK(7643)15 THEN POKE 764,255:
710 680:GOTO 80
720 IF INPUT0(0)0 THEN FILE0=0
1:FILE0=0:INPUT0:RETURN
730 FILE0:INPUT0:RETURN
740 REM *****
750 IF FLAG0 THEN FLAG/FLAG+1:GOTO 80
760 GRAPHICS 0+32:POKE 789,18:POKE 718
,24
770 ? "5" SAVE SCREEN | "L" LOAD SC
REEN"
780 ? "1" SHOW MORE | "0" CEASE M
ORE"
790 ? "PRESS TRIGGER TO RETURN TO ROM
M000"
800 IF PEEK(7643)255 THEN 810
810 IF STICK(0)15 THEN 800
820 FLAG=0
830 GRAPHICS 0+16+32:POKE 789,2:POKE 7
18,0:GOTO 80

```



Tired of typing?  
Take advantage of our  
finger-saving offer on Page 61.

ATARI users who buy Atari Logo are doubly fortunate. Not only have they acquired a programming language which is friendly to use and will help them to develop a good programming style, but also with it they have a version of Logo with some very special features.

The Atari machines are really very good host computers for Logo. Firstly, because the Logo comes on a ROM cartridge and, because of the way the machine is arranged, it really is a Logo machine.

It doesn't waste valuable memory space resetting vectors, as is done with some disc-based Logos running on what are really Basic computers.

Secondly, the Atari's collision counter routine provides an exciting extension to Logo which allows interesting things to be done with the hardware sprites — resident in the computer, as distinct from the program — which are another feature of the machine.

Thirdly, the Atari has four voices and is capable of producing musical effects. Though possession of a disc drive is an undoubted advantage, it is not essential. Your work can be saved on to cassette.

To get the best from this Logo, though, it is highly desirable that you have a colour television — or you may use a monitor with either the 800XL or 800X. Atari Logo will run on the 400 and 800XL machines which have only 16k of RAM although this really does not leave much room to do a lot.

The whole point about Logo is that it is intended to be a tool to think with. Unlike some other programming languages, it does not try to force the human to accommodate to the machine, but attempts to create a highly-consistent world which is friendly to the human user.

This is reflected in the Logo data types, words and lists, which really reflect the types of objects which human beings process. What are words? Well, in Logo words are pretty much the same as they are in the human world, collections of characters, terminated by a space.

Spaces are significant in Logo, miss them out and the system will issue an error message.

There are a group of words with which the Logo system starts up

# Atari and Logo — just made for each other

called primitives. When you type one of these the system knows what to do.

There is a very simple syntax which indicates to the system how it is to treat any words which it encounters. If there is no mark in front of the word — that is just the word itself — it attempts to execute it.

It sees it as a command, either a primitive or a procedure. But more on procedures shortly.

If the word is immediately preceded by a colon, "dots" in Logoese, it means that the value assigned to that word is being called

assigned one, you will get the message saying FIBS HAS NO VALUE (if FIBS was the name of the word), which is somewhat more helpful than NO SUCH VARIABLE IN 2050.

Numbers are treated by Logo as being special forms of words. Lists are simply collections of words or other lists. They frequently form the values which get assigned to words.

Lists are indicated, delimited, by the use of square brackets, thus [THIS IS A LIST].

If you MAKE "GREET [HELLO, ATARI TURTLE LOVERS.] and then

## DEREK RADBURN introduces you to a micro love affair

for — that is, it attempts to evaluate.

However, if there is a double quote in front of the word, such as 'TOPS', then the system takes the word literally and does not do anything to it. So PRINT 'TOPS would result in TOPS appearing on the screen.

Let's expand this a little by attaching a value to TOPS. This can be done by using the MAKE primitive. In order to work, MAKE has to have two things. The first must be a name (quoted word) and the second may be another word or a list. I'll deal with lists in a moment.

Here's an example: MAKE 'TOPS 'SPOT. This has now assigned the word SPOT as a value to be called when you type PRINT 'TOPS, so consequently SPOT appears on the screen.

If you should attempt to reference a value when a word hasn't been

followed it with PRINT :GREET you should be able to predict now what will appear.

You may have noticed that all of the Logo here has appeared in upper case characters. This is because Logo is case-sensitive and does not recognise lower case letters.

With the earlier Atari 400 and 800 machines it is very important to be aware of this, since the Caps Lower key is directly adjacent to the Return key. Accidentally pressing this key will result in lowercase letters, which will not be recognised by Logo.

By some rather unhappy ergonomics it is necessary to press two keys together — Shift and Caps/Lower — to recover uppercase letters. This feature is particularly unhelpful to young Atari Logo users.

Turtle graphics is one of the best known and copied features of Logo.





Indeed, it is an all too-common misconception that this is all that Logo is.

I hope by choosing to start with words and lists I have dispelled some of these mistaken notions. Essentially, turtle graphics is an example of the friendly human interface in Logo.

We all have bodies, and through them we have a spatial awareness of body geometry. We know which way we are facing, and know our position. We do not use coordinates to guide our movement — we simply go forwards or backwards and make turns which alter our heading at appropriate times.

Logo uses precisely these commands to control the position of the turtle. It may be a robotic device which runs around on the floor or it may be just a symbolic screen turtle. The Atari one actually does look like one, but most are only triangles.

Whichever is used, both can record their paths by putting down a pen, one of three per turtle. There are four turtles. Their shape can be redefined by the user. This is done by calling the EDSH command. This must be followed by the number of the shape to be edited (or created).

Suppose you wish to create shape 1 — you may have up to 15 — then you would type EDSH 1. You would be rewarded by seeing an 8 column by 16 row grid.

Shape definition takes place by

moving around the grid using the combination of holding the Control key down and pressing the cursor arrow keys on the right of the keyboard.

The space bar acts as a toggle which, when pressed, fills in empty cells, or clears filled cells, whichever is under the cursor.

There is one point to bear in mind about these user defined shapes. Unlike the original system turtle character they do not alter their orientation to reflect the heading which has been selected. Put simply, this means your planes could be seen flying backwards across the screen, though I prefer multi-coloured flying pigs.

Another special feature of Atari Logo are multiple turtle sprites. It is possible to have up to four turtles, which may have their original shape or be given one defined by the user.

Any of these shapes may be given a velocity by using the SETSP command, which affects the currently active turtle. The speed may be between -200 and 200 (you can guess the effect of a negative input, can't you?).

Do not view the world of the turtle as being separate from words and lists — everything in Logo is based on these. For example, let's draw a shape (7). Type: FD 30 RT 30 FD 30 LT 30 FD 30. When you press Return, provided you remembered the

spaces, the five commands should execute.

Now try this: MAKE "WRIGGLE [FD 30 RT 30 FD 30 LT 30 FD 30]. Clear the screen by typing CS and pressing Return. (At this point I shall expect that you already know or have realised the need to press Return.) Now try: RUN "WRIGGLE.

The RUN command in Logo needs to have list of executable items as its input.

Logo has a nice loop structure, REPEAT, which needs two inputs. The first must be a numeric value which tells it how many times to loop. The second must be a list with executable items for it to do.

Try this: REPEAT 3 "WRIGGLE. Do you see the connection between RUN and REPEAT? Now that use of REPEAT was not too interesting was it? Try this: REPEAT 6 [RUN "WRIGGLE RT 180 RUN "WRIGGLE RT 120].

Another way of achieving the same result is to type TO WRIGRAY. As soon as you typed this and pressed Return notice the change.

Look at the prompt. Instead of the usual top level (interactive command level) prompt of `>`, you will see a `>`. This signifies that you are in the defining mode and have begun to define a procedure.

The computer no longer responds

immediately to what you type, it is storing it and will only execute it when you tell it to. You do this by typing the name which follows TO. You are on the way to defining a procedure.

The change which occurs in the computer's behaviour when the defining mode is first invoked often causes confusion to novices. There are only two ways in which you can leave this mode.

The first is by typing on a line of its own, the word END, in which case the procedure gets defined. The other is to abort the whole enterprise by pressing the Break key.

With the Atari, this does not have the devastating effect it does with some other machines - Reset does that! Should you press the Break key, definition proceeds no further.

So, to continue, type:

```
TO WRIGRAY
  REPEAT 6 CIRCLE RT 100 WDRGLE
  RT 120
END

TO WRIGGLE
  FD 30 RT 30 FD 30 LT 30 FD 30
END
```

Notice now that we have a variable attached to WRIGGLE and also a procedure called WRIGGLE. The Logo system sees both as different objects.

To alter a previously defined procedure means entering the editor. This can be done by typing ED "WRIGRAY. It is a full screen editor of the sort usually found with Logos.

What you see on the screen is what you get. Movement around the screen is by the Ctrl and arrow key combination already described. After editing, you may leave and retain your amendments by typing Esc, or abandon the changed version, while still retaining the original unaltered version by typing Break.

Logo is essentially an exploratory environment. Although Atari Logo is accompanied by extremely good documentation, the best way to become accomplished with it is to do it.

In this article I have purposely avoided giving anything which might be an "end". Rather, I have tried to hint at beginnings for your own learning and pleasure.



*Here are some procedures for you to tinker with. Prettypol brings them all together. Experiment with them and have fun.*

This procedure draws a regular polygon of a given number of sides, of a size scaled by the number of sides:

```
TO POLYB :SIDES :SIZE
  REPEAT :SIDES CPO (:SIZE / (:SIDES)
  RT (:360 / :SIDES)
END
```

This procedure draws a predetermined number of polygons rotated around an axis:

```
TO MULTPOL :TURNS :SIDES :SIZE
  REPEAT :TURNS (POLYB :SIDES :SIZE
  RT 360 / :TURNS)
END
```

This procedure causes three polygonal patterns to be drawn in random colours in random positions. BG gives the value of the background colour, ST shows turtle, FS gives a full screen of graphics - you should be able to deduce the rest. It's important to note that this procedure leaves the system as it found it:

```
TO PRETTYPOL
  MAKE "SCREENCOL BG
  SETBS 6
  ST FS
  REPEAT 3 (PC.CHOOSE CNOOSEPOS
  MULTPOL (1 + RANDOM 12) (3 + RANDOM
  10) (100 + RANDOM 100) PERCHOOSE)
  NT
  FINISHP BG
  SETBS "SCREENCOL
  ERN "SCREENCOL
  END
```

This procedure chooses a new pencolour, but checks to see that it is not the same as the background colour. Notice the IF test. IF is always followed by a list which gets RUN if the condition tested for is found to be true. Optionally a second list will get executed if the condition is false:

```
TO PC.CHOOSE
  SETPC PN (1 + RANDOM 12)
  IF BG = PC PN (PC.CHOOSSE)
END
```

This one simply sets a position for the turtle:

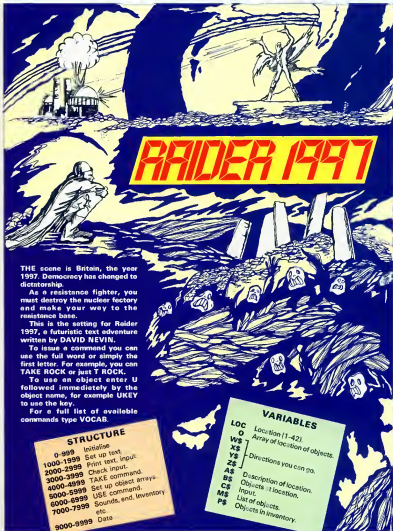
```
TO CHOOSSEPOS
  PU
  SETX -80 + (RANDOM 100)
  SETY -80 + (RANDOM 100)
  PD
  END
```

This procedure cycles through the three pens:

```
TO PENCHOSE
  IF PN < 2 (SETPN (PN + 1) (SETPN
  0)
  END
```

This procedure waits for a key to be pressed to indicate the user has finished:

```
TO FINISHP
  IF KEYP (STOP) (RECYCLE FINISHP)
  END
```



THE scene is Britain, the year 1997. Democracy has changed to dictatorship.

As a resistance fighter, you must destroy the nuclear factory and make your way to the resistance base.

This is the setting for *Raider 1997*, a futuristic text adventure written by DAVID NEVIN.

To issue a command you can use the full word or simply the first letter. For example, you can TAKE ROCK or just T ROCK.

To use an object enter U followed immediately by the object name, for example UKEY to use the key.

For a full list of available commands type VOCAB.

### STRUCTURE

0-999	Initialise
1000-1999	Set up text.
2000-2999	Print text, input.
3000-3999	Check input.
4000-4999	TAKE command.
5000-5999	Set up object arrays.
6000-6999	USE command.
7000-7999	Sounds, end, inventory etc.
9000-9999	Date

### VARIABLES

LOC	Location (1-42).
O	Array of location of objects.
WS	
X\$	
Y\$	
Z\$	Directions you can go.
A\$	Description of location.
B\$	Objects in location.
C\$	Input.
M\$	List of objects.
P\$	Objects in inventory.

## Game

[illegible][illegible][illegible]

**Tired of typing?**  
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finger-saving offer on Page 51.

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## MIKE BIBBY gives you the lowdown on . . .

IN previous articles we've seen that binary numbers can be added and subtracted just as our more familiar decimal numbers are. And, of course, we can multiply and divide them.

There are, however, other ways of combining two binary numbers that are extremely useful in dealing with computers. They're also easy to use, so let's have a look at them.

Firstly, we'll see how we can NOT a binary number — simple, one-bit numbers first. By the way, we're going to be dealing exclusively with binary numbers this month, so we can drop the % sign.

The rules for doing a NOT are simple:

If the bit is 1 then it becomes 0  
If the bit is 0 then it becomes 1

If you like, the NOT converts a bit into its opposite.

So NOT 1 = 0  
And NOT 0 = 1

Why do we use the word NOT? Well, mathematicians often use the number 1 to mean true and 0 to mean false.

So NOT 1 means not true, which means false, which is 0. That is, NOT 1 is 0. And, as not false is most certainly true, NOT 0 is 1.

If we are to NOT a binary number consisting of several bits, we simply apply the rule for NOT to each bit individually.

So NOT 1011010  
becomes 0100101

Some people think of this process as turning the number on its head, so it's sometimes called inverting. Others call it taking the complement of the number.

NOT just works on a single binary number. However, there are other sums or operations that have a set of rules for combining two binary numbers.

For instance, we can AND two binary numbers. Let's look at the rules for ANDing a single bit with another bit.

When you think about it, there are four possible combinations of bits that we could AND — 0 with 0, 0 with 1, 1 with 0 and 1 with 1.

We write that we are ANDing, say,

0 with 1 as 0 AND 1.

The rules for ANDing are:

0 AND 0 = 0 (case a)  
0 AND 1 = 0 (case b)  
1 AND 0 = 0 (case c)  
1 AND 1 = 1 (case d)

Notice that the only time the result is 1 — true — is when the two bits ANDed are both 1 — true. This helps us to see why we use the word AND to describe the operation.

If you think of the first bit as "this" and the second bit as "that", what we're doing when we're ANDing is asking whether "this and that" is true.

"This and that" can only be true when both "this" is true AND "that" is true — hence the use of AND to describe the process.

For example, consider the statement that it is dry and sunny.

This is true only if dry is true and sunny is true — case d.

If either of the two, or both are false — cases a, b, c — the whole statement is false, since it isn't both dry and sunny.

We can AND pairs of binary numbers of more than one bit — just apply the rules of ANDing to each bit individually.

For example:

AND 10010110  
AND 10110011  
gives 10010010

# The inside story of binary operations

We can also OR two binary numbers. The rules for ORing a single bit with another bit are as follows. Again there are four possible combinations:

0 OR 0 = 0 (case e)  
0 OR 1 = 1 (case f)  
1 OR 0 = 1 (case g)  
1 OR 1 = 1 (case h)

In this case you only get a false result, 0, when both bits are false. If either or both bits are true, 1, the result is true. It's easy to see why we use OR to describe this. If one OR the other OR both is true the whole thing is true.

Let's use the meteorological analogy again. Consider the statement that it is dry or sunny.

This is only false when it is NOT dry and NOT sunny — case e — otherwise it is TRUE — cases f, g, h.

To sum up, with OR the whole thing is true if either or both the things being ORed is true.

As we did with AND, we can OR pairs of numbers with more than one bit — we just apply the rules of ORing to each bit individually.

For example:

10010110  
OR 10110011  
gives 10110111

● In the next article we'll look at EOR and the use of masks.

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# DELVING INTO THE ATARI'S INNARDS

I BOUGHT an Atari 800XL soon after they became available — in the firm belief that the full hardware details would be available, as they were for the earlier Atari 800.

The questions I particularly wanted the answers to are the following:

- How to enable the shadow RAM. Your article on the XL indicates that the technique used is not as easy for the XL.
- The details of the signals and the timing at the edge connectors.

With this information available, constructors could attach a variety of peripherals to the XL series. — **Donald W. Sharp, Newcastle upon Tyne.**

- The shadow RAM under the Operating System and Basic — there's \$A000-\$BFFF for Basic and \$C000-\$CFFF & \$D000-\$FFFF for the OS — can be switched in and out by changing bits 0 and 1 in location \$0301, as shown in the table with the article in the June issue of Atari User.

However, it can't be done from Basic, as the computer would instantly crash — hence the warning not to try it with a POKE.

Switching either Basic or the OS must be done with a machine code program in memory. To stop the OS

running before banking it out, set NMEN (\$040E) to zero. Only set it back to \$40 — 64 decimal — when you have switched the OS ROM back into place.

\$0000-\$07FF can never be used as RAM, because they contain information vital to other chips such as Antic, Pokay and Gtse.

There was a very good series of articles about using the Parallel bus in the January to April Antic Magazine (Vol. 3/9 to Vol. 3/12).

I started from scratch, and ended up showing you how to build and run an RS-232 interface via the bus connector.

## Bulletin boards

THANKS for an excellent and much needed magazine for the Atari community. Your June issue on communications was especially interesting.

I saw the numbers for bulletin boards and wondered whether you would include

mine in future listings?

The board is Atari based and orientated, called CyberZone, and the number is 01-638 2034. It's a 24-hour auto-answer service. — **Brian Saunders, via Prestel.**

## Micro connection

I WOULD like to know whether two Ataris can be connected by an I/O cable (Program Recorder/Disc Drive card) and a program loaded from one to the other?

Secondly, how do you connect several peripherals which all use the I/O interface to your Atari? — **Craig Brady, age 14, Bristol.**

P.S. I typed in the Poke to suppress the clicking sound on my Atari 400 16k, and after trying four times, it still didn't work.

- A standard I/O cable will not allow data to go from one machine to another. By re-wiring "Data-In" to "Data-Out", changing the +5V line and

re-wiring the clock-in/out lines, it might work. Can't say we've ever tried it, though.

The easiest way is to save on to tape from one machine, swap the recorder over, and load it back again on the other. Also, the joystick ports can be re-programmed for direct data exchange.

Perhaps someone out there has done it and would care to write in?

There are two I/O sockets on each peripheral in the Atari range, and you simply plug the second unit into the back of the first, and so on.

The codes listed in the letters page in Issue 1 from David Eckersley work OK, but they are for the XL and XE ranges only. They use some of the new features not available on the old Atari range. Sorry.

## Edge connectors

I OWN an Atari 400 and would like to explore its expansion and interfacing capabilities. Due to the distinct lack of an expansion office, I am finding it not at all easy.

I have a project in mind which would need me to access both the data and address bus. Is there any way I can get to these?

I have noticed some edge connectors on the 400's board — could you explain these?

Also, could you tell me if the Atari 400 is directly compatible with the Atari disc drive, without the expansion interface? — **Edmund McConnell, Leicester.**

- Information on circuit layout, connections, and so on is in the "Technical Reference Notes for the 400/800", published by Atari at £17. It

# Jumping into difficulties

I HAVE endeavoured to type the Frog-Jump game — in your June issue — into my computer.

However, this keeps coming up with Error on Line 340, 350 and 360.

I haven't typed any further, so do not know if there are any other errors.

I am wondering, therefore, if you could advise me of the correct lines for this game.

Abs, I have an Atari 800 with cassette, but am thinking of buying a disc drive. Can you tell me if it is possible to record from the cassettes to disc?

I have many games on the cassettes, but don't want to buy a disc drive if it is impossible to break into the program. — **G. Newlin, Walton-in-Thames.**

- There were no errors in the listing as printed, so you have almost certainly made some typing mistakes.

You don't say what the error number was, but we suspect it was an Error 5. If this is the case, you should check Line 80 very carefully and make sure you have entered it as listed.

For example, make sure you

have used 1 — number one — and not i — capital letter i — in strings like L1\$.

Most commercial games are fairly heavily protected, so you would probably not be able to move them to disc — particularly if they load in more than one section.

However, the time saved in loading possibly outweighs the cost of replacing your favourite games.

You may also be able to recover some of the money by selling the cassette versions to people who haven't yet got a disc drive.

should be available from specialist shops, or mail order from Software Express, Silca Shop, and others.

The edge connectors you mention are extensions of the processor bus – left in the machine as engineer test points, but it's up to you what you want to do with them.

Don't forget that if you open your machine, you will invalidate your guarantee.

All Atari peripherals – disc drives, printers, cassette recorders, and so on – will connect to any Atari computer directly, via the 13-pin socket on the side.

However if you only have a 16k machine, you would only have about 8k left for programming after OOS loads into memory.

## Why the bleeping?

WHEN I got my 800XL I found there was a "bleep" on the screen every third line you went down.

I went to the shop where I got it from and they checked it. It seemed that the "bleep" was all of the 800XLs.

So please, please tell me what is that "bleep" doing there?

Is it some kind of safety device? – **Nell McCulloch, Denby, Stirlingshire.**

● We're not sure what you mean but suspect that you're referring to the beep which warns that you are about to exceed the allowable length of program line. If so, it's certainly meant to happen.

## Memory check

I HAVE a 600XL. Being only 16k memory, many advertisements for games and utilities don't help me at all.

If I want to order anything I first have to write or telephone the company selling the product to see how much memory it takes up.

I am saving up for the 48k

# ATARI USER Mailbag

WE welcome letters from readers – about your experiences using the Atari macros, about tips you would like to pass on to other users... and about what you would like to see in future issues.

The address to write to is:

**Mailbag Editor  
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expansion, but for all the people who have only got 16k and will stay with 16k could you please ask your advertisers to show how much memory the product needs?

I know that the 600XL is "going out" but don't rub salt in the wounds.

Also regarding the monthly disc – spare a thought for those with no disc drive and put the offer on cassette as well – **K. Fellea, Middleton, Manchester.**

## Doing it the hard way

CONGRATULATIONS on your magazine.

I have a 600XL which I bought in January and until Atari User was issued I had learned practically nothing.

The articles by Dave Russell, Mike Bibby, Pete Bibby and others are so easy to follow that I'm amazed by what I can do already.

I have the books Atari Programming with 55 Programs by Linda M. Schreiber and Making the Most of Your Atari by Paul Bunn, and although I learned a little bit from these I wasn't learning enough.

I could never figure out what data was until I read Dave Russell's second article on graphics mode. Now I can write small programs using data.

I hadn't got a clue what binary was until Mike Bibby's article on the subject. I've

forgotten for the moment how to write J1. Now I can convert numbers into binary.

Now about the listings. I tried four times to write (if that's the term) Alphabet Train into my computer, which took me about three hours each time.

I could never get it to work, so I tore it up in disgust.

I did manage to get Frog Jump to work, but not very well – but that could be because of my joystick.

Submarine works fine, but not Etche Sketch nor Attack Squash.

I did have a program recorder at one time but could never get it to record any of the listings so I got rid of it.

Now all I have is my computer and joystick, so I have to type in the listings every time – so it would be great if I could get them so work every time.

Any tips please? – **Colin Keegan, Holyhead.**

● Our main suggestion is that you buy another recorder or save up for a disc drive. It will save you hours of typing time which you can use to debug your programs.

## Defender score

COULD you tell me if there is an Atari user group in Bristol?

Also, having seen that high score on Drop Zone, I would like to see whether anyone can beat my top score on Defender. I managed to reach over 3

million and gave up with over 60 lives – although it took me about 2½ hours.

Let's have more articles and programs on the more-complicated side of the Atari computer – machine language techniques, hardware, and so on.

Also, is it possible to get a modem which costs less than £100? – **P. Fregepene, Badminton, Bristol.**

● The address of the East Bristol user group is c/o 2 Channons Hill, Industrial Estate, Fishponds, Bristol.

The Maplin modem costs around £50... but you'll need an 850 module as well. This applies to all the cheaper modems as far as we know.

## Frightened off

YOUR news item about Atari's going "bump in the night" seemed quite appropriate considering my 800XL's penchant for "locking-up" when I play the Scott Adams' Ghost Town adventure.

I wonder if other readers have found that their machines take fright in this manner? – **J. Huggill, Leicester.**

## Checking errors

I WISH to comment on Les Bostock's request that some form of typing check program be included in your magazine.

I run a computer club for 5 to 13-year-olds and when I see good programs in magazines I ask the children if they would like to type them in. They do, and enjoy it.

When all those lines have been typed in and they then try to run it, you can imagine how disappointed they are when it shows errors at line so and so.

It is then left to me to try to debug the programs. This takes up much-needed time when I could be doing something else for the club.

So yes I do agree with

Let's that an error-checking program would be of great assistance.

It's a shame that all Atari support magazines could not use the same error-checking programs, something like Type II, which I think is the best, in trying to assist their readers.

May I say that you have a good magazine. — **B. Spooner, Fishguard, Pembro.**

## Confusing check-sums

I HAVE just bought Issue 2 of your great magazine and am pleased to say that it is even better than Issue 1.

I find Bit Wise very useful, but how about an article or three on assembly/machine code?

As for the argument over a check-sum routine, my views depend on which type you decide to offer, as the type tables for Antic and so on are quite confusing. A better type is the one used by Compute.

You argued that it's good to get some practice at de-bugging, but if you are inexperienced you might find this very difficult and having a check-sum would reduce the frustration of typing in listings.

Also, if you do want to de-bug you have not got to use the check-sum if you don't want to.

Finally, as many big American magazines use type tables it must be of some use to American users, and if the type tables are not really used you can always drop them at a later date.

Another article that would be welcome is an explanation and programs showing the use of player/mozzies and redefining the character set as this is ignored in my 800 manual and I have not discovered any books explaining them simply.

— **N. Buckle, Crayford, Kent.**

● It's interesting that you don't like Asnic's check-sum methods — many people have suggested we use the same method as Antic.

## Atari's on the air

CONGRATULATIONS on a brilliant magazine.

I am a radio amateur and have been using — or trying to use — my Atari 800 for radio-based programs.

I have been able to send radio teletype and Morse in both transmit/receive and also I have a very good Morse training program.

Unfortunately, whenever I approach software suppliers about programs for radio communications, all I get is: 'Atari? That's a games machine — we don't keep anything like that'.

As this type of software is readily available for such machines as BBC, Spectrum, Dragon, Commodore, Amstrad, to name but a few, what has Atari got that these other machines do not seem to have? Could it be lack of support?

Anyway, if you know anybody who can help, or anybody who wants help, or anybody who is just interested with radio-type programs then can you please pass on my name? — **J.M.A. Sheppard, Bristol.**

## Typing error

I'M a beginner with the Atari and so your magazine has taught me a great deal.

But unfortunately, with quite a few games which I have typed in, when I Run it always produces an error.

I always check the listing so it isn't a typing error.

I typed in Attack Squash and it produces error at line 830. It said goto 720 which doesn't even exist.

Could you please help me to understand my computer, and explain to me the error in Attack Squash.

Also, could you please tell me whether there are any groups around the Orpington area, where I could go to talk to other people with the same

problems? — **G. Gouveia, Orpington, Kent.**

● We reprinted Attack Squash as it appears in the Atari Book of Games. You're right that line 720 doesn't exist, but the author obviously altered the program so that it never gets to line 830. Hence you must have made a typing error somewhere along the line.

There is a user group in Tunbridge Wells and the contact is Mr T. Chamberlain, 29 Albany Hill, Tunbridge Wells, Kent TN2 3RX.

## Switch-on sequence

I HAVE an Atari 800XL and my dad has a Tandy TRS-80 colour computer.

In one of the Tandy manuals it says that switching on the computer without connecting it to the television can damage it. Why is this the case?

Also, does it apply to Atari

micros, as I have a friend with an Atari 800XL which he leaves on for long periods of time with the television switched off.

It says in one of the Atari manuals that inserting or removing a cartridge with the computer switched on can damage the cartridge. Can it also damage the computer? — **Peter Goulden, Heleaton, Cornwall.**

● As far as we know switching a micro on without connecting it to a TV can't do any damage.

Possibly what your Dad's Tandy manuals are suggesting is that you turn on all the peripherals — TV, disc drives etc — before you turn on the micro. This will stop a possible mains "spike" from something like the TV on-off switch damaging your computer.

For the same reason, you should turn the micro off first. Plugging or removing cartridges with the computer switched on could cause damage and should be avoided. It's a bit like surgery without anaesthetic — possible, but not recommended!

## Games shortage

YOUR magazine is a most helpful teaching aid into computer programming.

As for the Atari company, I am not full of its praise.

On purchasing the Atari 800XL I was surprised that Atari did not supply at least one game tape to test the machine.

And the manuals that came with the machine contained typing errors.

The main problem concerned the computer, which would not load. But as an amateur, I had no idea what was the matter.

I first decided that the tapes were at fault. I had these tested — they were all right.

So I changed the Atari 1010 tape recorder for another one. Still no luck.

In the end I received a new computer but this would not load either.

This time the Atari tape recorder was at fault. It is now

being repaired.

Throughout this whole episode there was no Atari dealer to ask advice from.

There is also the added difficulty of finding Atari computer games.

Woodwards of Henley and Wolverhampton have depleted their stock and inform me that they are no longer interested in stocking Atari games tapes.

This also applies to all W.H. Smith shops. They only sell Atari books and Laskys do no better.

On reflection, I would have done far better buying Commodore, or Spectrum.

At least they sell their own products through their shop, with well trained staff, and not through individual electrical outlets. — **H. Smith, Stafford.**

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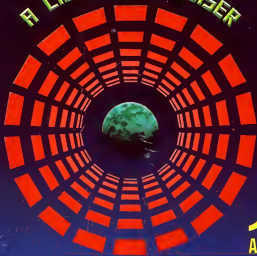




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